Florida Department of Education
Curriculum Framework

Program Title: **Technical Design**
Program Type: **Non Career Preparatory**
Career Cluster: **Engineering & Technology Education**

Secondary – Non Career Preparatory	
Program Number	8401000
CIP Number	0650040900
Grade Level	9 – 12, 30, 31
Standard Length	3 credits
Teacher Certification	TEC ED 1 @2 ENG @7 7G DRAFTING @7 7G GRAPH ARTS @4
CTSO	Florida Technology Student Association (FL-TSA)
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 technical design. This program focuses on transferable skills and stresses understanding and operation of complex two and three-dimensional graphics, editing, and image analysis tools to better understand, illustrate, explain, and present technical concepts and principles. Science, math, and visual design concepts are reinforced throughout each course.

The content includes, but is not limited to, a study of the purposes, instruments, processes, and technical skills associated with technologies used in the design, creation, and deployment of technical design renderings. In addition to complex illustration tools, the content of this program includes the development of essential computer application skills (e.g., word processing, spreadsheet, presentation). The content and activities will also include the study of entrepreneurship, safety, and leadership skills.

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

Program Structure

This program is a planned sequence of instruction consisting of three one-credit courses. The following table illustrates the program structure:

Course Number	Course Title	Length	Level	Graduation Requirement
8401010	Technical Design 1	1 credit	3	PA
8401020	Technical Design 2	1 credit	3	PA
8401030	Technical Design 3	1 credit	3	PA

(Graduation Requirement Abbreviations- EQ= Equally Rigorous Science, PA= Practical Arts, EC= Economics, VO= Career and Technical Education)

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.

Academic Alignment Table

Academic alignment is an ongoing, collaborative effort of professional educators specializing in the fields of science, mathematics, English/language arts, and Career and Technical Education (CTE). This initiative supports CTE programs by improving student performance through the integration of academic content within CTE courses. Career and Technical Education courses that have been aligned to the Next Generation Sunshine State Standards for Science and the Florida Standards for Mathematics and English/Language Arts will show the following data: the quantity of academic standards in the CTE course; the total number of standards contained in the academic course; and the percentage of alignment to the CTE course.

Courses	Anatomy/ Physiology Honors	Astronomy Solar/Galactic Honors	Biology 1	Chemistry 1	Earth-Space Science	Environmental Science	Genetics	Integrated Science	Marine Science 1 Honors	Physical Science	Physics 1
8401010	3/87 3%	8/80 10%	10/83 12%	8/69 12%	13/67 19%	5/70 7%	3/69 4%	10/82 12%	7/66 11%	13/74 18%	7/72 10%
8401020	3/87 3%	4/80 5%	9/83 11%	4/69 6%	9/67 13%	2/70 3%	3/69 4%	9/82 11%	4/66 6%	9/74 12%	3/72 4%
8401030	3/87 3%	5/80 8%	1/83 1%	5/69 7%	3/67 4%	4/70 6%	3/69 4%	1/82 1%	5/66 8%	4/74 5%	5/72 7%

** *Alignment pending review* # *Alignment attempted, but no correlation to academic course*

Courses	Algebra 1	Algebra 2	Geometry	English 1	English 2	English 3	English 4
8401010	7/67 10%	1/75 1%	10/54 19%	17/46 37%	17/45 38%	#	#
8401020	6/67 9%	#	7/54 13%	14/46 30%	14/45 31%	#	#

Courses	Algebra 1	Algebra 2	Geometry	English 1	English 2	English 3	English 4
8401030	2/67 3%	2/75 3%	5/54 9%	#	#	10/45 22%	10/45 22%

** *Alignment pending review* # *Alignment attempted, but no correlation to academic course*

Florida Standards for Technical Subjects

Florida Standards (FS) for English Language Arts and Literacy in History/Social Studies, Science, and Technical Subjects are the critical reading and writing literacy standards designed for grade 6 and above. These standards are predicated on teachers of history/social studies, science, and technical subjects using their content area expertise to help students meet the particular challenges of reading, writing, speaking, listening, and language in their respective fields. It is important to note that the 6-12 literacy standards in history/social studies, science, and technical subjects are not meant to replace content standards in those areas but rather to supplement them.

This curriculum framework incorporates the grades 9-10 reading and writing literacy standards in the first two courses of this CTE program and grade 11-12 reading and writing literacy standards in the third and fourth courses of this CTE program. The standards for Mathematical Practices describe varieties of expertise that educators at all levels should seek to develop in their students. These practices rest on important "processes and proficiencies" with longstanding importance in mathematics education. This curriculum framework incorporates the appropriate mathematical practices in the first four courses of this CTE program.

Common Career Technical Core – Career Ready Practices

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

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

2. Apply appropriate academic and technical skills.

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

4. Communicate clearly, effectively and with reason.

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

6. Demonstrate creativity and innovation.

7. Employ valid and reliable research strategies.

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

9. Model integrity, ethical leadership and effective management.

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

11. Use technology to enhance productivity.

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

Standards

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

01.0 Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Technical Design.
02.0 Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Technical Design.
03.0 Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Technical Design.
04.0 Demonstrate an understanding of the characteristics and scope of technology.
05.0 Demonstrate an understanding of the core concepts of technology.
06.0 Demonstrate an understanding of the relationships among technologies and other fields of study.
07.0 Demonstrate an understanding of the influence of technology on history.
08.0 Demonstrate an understanding of the attributes of design.
09.0 Apply the principles of engineering design in the creation and evaluation of a prototype.
10.0 Be able to select and use information and communication technologies.
11.0 Demonstrate an understanding of the processes and technologies employed in the design and production of technical illustrations and drawings.
12.0 Demonstrate technical knowledge and skills about the use and care of drafting instruments, equipment, and materials.
13.0 Demonstrate technical skills and applications common to all types of drafting.
14.0 Demonstrate technical knowledge and skills for making basic orthographic drawings.
15.0 Demonstrate technical knowledge and skills for making pictorial drawings.
16.0 Demonstrate technical knowledge and skills for making auxiliary view drawings.
17.0 Demonstrate technical knowledge and skills for making sectional view drawings.
18.0 Demonstrate technical knowledge and skills for making working drawings.
19.0 Demonstrate technical knowledge and skills for making a basic residential drawing.
20.0 Identify computer components and their functions.
21.0 Demonstrate proficiency with common computer peripherals, including connections to standard input and output devices.
22.0 Demonstrate knowledge of computer file management.
23.0 Demonstrate proficiency using the Internet to locate information.
24.0 Demonstrate an understanding of Internet safety and ethics.
25.0 Develop and apply word processing and document manipulation skills.
26.0 Develop and apply fundamental spreadsheet skills.
27.0 Demonstrate an understanding of color theory and its role in technical design.
28.0 Demonstrate an understanding of the elements and principles of graphic design.
29.0 Develop a design portfolio.
30.0 Demonstrate an understanding of the various approaches used in problem solving.
31.0 Demonstrate abilities to apply the design process.
32.0 Create architectural drawings to industry standards.
33.0 Create a reverse engineered drawing (as built) from a solid object.
34.0 Create technical illustrations.
35.0 Demonstrate proficiency in using presentation software.
36.0 Create technical illustrations using illustration software applications.

37.0 Create technical drawings using software applications.
38.0 Maintain a design portfolio.
39.0 Demonstrate technical writing skills.
40.0 Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Technical Design.
41.0 Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Technical Design.
42.0 Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Technical Design.
43.0 Demonstrate an understanding of the cultural, social, economic, and political effects of technology.
44.0 Demonstrate the abilities to use and maintain technological products and systems.
45.0 Demonstrate the abilities to assess the impact of products and systems.
46.0 Demonstrate technical knowledge and skills for making engineering drawings.
47.0 Demonstrate and present a research and design project.
48.0 Demonstrate an understanding of career opportunities and requirements in the field of drafting/illustrative design technology.
49.0 Demonstrate familiarity with techniques associated with digital photorealism.
50.0 Create complex technical drawings using appropriate software applications.
51.0 Prepare and present a design portfolio.

Florida Department of Education
Student Performance Standards

Course Title: **Technical Design 1**
Course Number: **8401010**
Course Credit: **1**

Course Description:
This course provides students with instruction in the characteristics and evolution of technology, underlying principles of design, and fundamental knowledge and skills in the use of illustration and drafting software. Included in the content is the use of essential application software.
The ultimate output of this course is a design portfolio created by the student. Each item or product included in the portfolio should include a narrative description and an explanation of the technical approach or techniques used to create the item. Consideration should be given to having students present the portfolio using presentation software.

Florida Standards			Correlation to CTE Program Standard #
01.0	Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Technical Design.		
	01.01 Key Ideas and Details		
	01.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. LAFS.910.RST.1.1	
	01.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.910.RST.1.2	
	01.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.910.RST.1.3	
	01.02 Craft and Structure		
	01.02.1	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. LAFS.910.RST.2.4	
	01.02.2	Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). LAFS.910.RST.2.5	

Florida Standards			Correlation to CTE Program Standard #
	01.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. LAFS.910.RST.2.6	
01.03	Integration of Knowledge and Ideas		
	01.03.1	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. LAFS.910.RST.3.7	
	01.03.2	Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. LAFS.910.RST.3.8	
	01.03.3	Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. LAFS.910.RST.3.9	
01.04	Range of Reading and Level of Text Complexity		
	01.04.1	By the end of grade 9, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	01.04.2	By the end of grade 10, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 9–10 text complexity band independently and proficiently. LAFS.910.RST.4.10	
02.0	Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Technical Design.		
02.01	Text Types and Purposes		
	02.01.1	Write arguments focused on discipline-specific content. LAFS.910.WHST.1.1	
	02.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.910.WHST.1.2	
02.02	Production and Distribution of Writing		

Florida Standards			Correlation to CTE Program Standard #
	02.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.910.WHST.2.4	
	02.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.910.WHST.2.5	
	02.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. LAFS.910.WHST.2.6	
	02.03	Research to Build and Present Knowledge	
	02.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.910.WHST.3.7	
	02.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. LAFS.910.WHST.3.8	
	02.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.910.WHST.3.9	
	02.04	Range of Writing	
	02.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.910.WHST.4.10	
03.0	Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Technical Design.		
	03.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	

Florida Standards	Correlation to CTE Program Standard #
03.02 Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
03.03 Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
03.04 Model with mathematics. MAFS.K12.MP.4.1	
03.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
03.06 Attend to precision. MAFS.K12.MP.6.1	
03.07 Look for and make use of structure. MAFS.K12.MP.7.1	
03.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
04.0	Demonstrate an understanding of the characteristics and scope of technology–The student will be able to:		
04.01	Discuss the nature and development of technological knowledge and processes.	LAFS.910.SL.1.1	
04.02	Conduct specific goal-directed research related to inventions and innovations.	LAFS.910.SL.2.5	
05.0	Demonstrate an understanding of the core concepts of technology–The student will be able to:		
05.01	Explain systems thinking and the relationship between logic, creativity, and compromise in solving complex problems.	LAFS.910.W.3.7, 8, 9	SC.912.N.1.1, 6
05.02	Describe technological systems and their role within larger technological, social, and environmental systems.	LAFS.910.W.4.10	SC.912.N.1.1, 6
05.03	Describe the trade-offs between competing values (e.g., availability, cost, desirability, waste, et al) in the selection of resources.	LAFS.910.W.4.10 MAFS.912.N-Q.1.1, 3	SC.912.N.1.1, 6
05.04	Describe the criteria and constraints of a solution and how they affect the final result.	LAFS.910.W.4.10	SC.912.N.1.1
05.05	Describe management and associated dynamics as they relate to technological development.	LAFS.910.W.4.10	SC.912.N.1.1

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
06.0	Demonstrate an understanding of the relationships among technologies and other fields of study–The student will be able to:		
06.01	Discuss technology transfer and its role in the evolution of technology.	LAFS.910.RI.1.1	
06.02	Describe the impact of sharing ideas, knowledge, or skills within a technology, among technologies, or across other fields.	LAFS.910.W.4.10	SC.912.N.1.1; 2.4
06.03	Explain how technological progress promotes advancement of science and mathematics.	LAFS.910.RI.1.1 LAFS.910.W.3.7, 8, 9	SC.912.N.1.1; 2.4
07.0	Demonstrate an understanding of the influence of technology on history–The student will be able to:		
07.01	Relate the advancement of technology to the evolution of civilization.	LAFS.910.RI.1.1 LAFS.910.W.3.7, 8, 9	SC.912.N.4.1
07.02	Describe ways in which technology helps to shape social, cultural, political, and economic aspects of society.	LAFS.910.RI.1.1 LAFS.910.W.3.7, 8, 9	SC.912.N.4.1
07.03	Describe the major technological developments that characterized the Industrial Revolution and their impact on society.	LAFS.910.RI.1.1 LAFS.910.W.3.7, 8, 9	SC.912.N.4.1
07.04	Describe the major technological developments that characterized the Information Age and their impact on society.	LAFS.910.RI.1.1 LAFS.910.W.3.7, 8, 9	SC.912.N.4.1
08.0	Demonstrate an understanding of the attributes of design–The student will be able to:		
08.01	Describe the essential activities that comprise the design process.	LAFS.910.W.2.4 LAFS.910.W.4.10	SC.912.N.1.1
08.02	Write a problem statement in sufficient clarity to enable design goals, requirements, and constraints to be identified.	LAFS.910.W.2.5;4.10 MAFS.912.N-Q.1.1, 3	SC.912.N.1.1
08.03	Critique the design of a solution and revise the design as needed.	LAFS.910.RI.3.8	SC.912.N.1.1
08.04	Explain how a design's criteria, constraints, and efficiency can compete with each other.	LAFS.910.SL.1.1,2,3	SC.912.N.1.1
09.0	Apply the principles of engineering design in the creation and evaluation of a prototype–The student will be able to:		
09.01	Describe the fundamental principles of design (i.e., flexibility, balance, function, and proportion) and how each guides the design process.	LAFS.910.W.3.7, 8, 9	SC.912.N.1.1
09.02	Describe how personal characteristics and collaborative effort influence the design process.	LAFS.910.SL.1.1,2,3	SC.912.N.1.1
09.03	Test a design concept by creating a prototype suitable for determining the effectiveness of the design.	LAFS.910.RI.3.8	SC.912.N.1.1
09.04	Identify factors taken into account in the process of engineering design.	LAFS.910.SL.2.4	SC.912.N.1.1
10.0	Be able to select and use information and communication technologies–The student will be able to:		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
10.01	Describe and give examples of the essential elements of a communication system (i.e., inputs, processes, and outputs).	LAFS.910.W.3.7 LAFS.910.SL.2.5	
10.02	Describe and give examples of human to human, human to machine, machine to human, and machine to machine communications.	LAFS.910.W.3.7 LAFS.910.SL.2.5	
10.03	Use information and communication systems to inform, persuade, entertain, control, manage, and educate.	LAFS.910.SL.2.4, 5	
10.04	Compare and contrast the means of communicating visual messages (i.e., graphically, electronically) and associated forms (e.g., digital, analog, and multimedia).	LAFS.910.W.3.7, 8, 9	
10.05	Compare and contrast the forms for communicating technological information (e.g., symbols, icons, graphic, measurement, et al).	LAFS.910.W.3.7, 8, 9	
11.0	Demonstrate an understanding of the processes and technologies employed in the design and production of technical illustrations and drawings–The student will be able to:		
11.01	Differentiate between the types of computer generated illustrations (i.e., renderings, images, collages, and animations) and their appropriateness.	LAFS.910.W.3.7, 8, 9	
11.02	Describe the activities and rationale for each step in the technical illustration process (i.e., information gathering, model creation, scene creation, rendering, and post production).	LAFS.910.W.3.7, 8, 9	
11.03	Describe the range of activities involved in producing technical drawings, from rough sketch to final rendering.	LAFS.910.W.3.7, 8, 9	
11.04	Compare and contrast the technologies used to produce technical illustrations and drawings using manual and computer methods.	LAFS.910.W.3.7, 8, 9	
12.0	Demonstrate technical knowledge and skills about the use and care of drafting instruments, equipment, and materials–The student will be able to:		
12.01	Identify and demonstrate technical knowledge and skills about the use and care of drafting instruments and equipment.	LAFS.910.W.4.10 LAFS.910.L.3.6	
12.02	Demonstrate technical knowledge and skills about the properties, specifications, and use of drafting materials and supplies.	LAFS.910.W.4.10 LAFS.910.L.3.6	
13.0	Demonstrate technical skills and applications common to all types of drafting–The student will be able to:		
13.01	Apply lettering techniques.	LAFS.910.W.4.10	
13.02	Make freehand sketches.	LAFS.910.W.4.10	
13.03	Use drafting symbols and alphabet of lines in accordance with technical standards and practices.	LAFS.910.W.4.10	
13.04	Apply measuring techniques.	LAFS.910.W.4.10 MAFS.912.N-Q.1.1, 3	SC.912.N.1.1
13.05	Apply industry standard dimensioning techniques.	LAFS.910.W.4.10 MAFS.912.G-CO.1.1	SC.912.N.1.1

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	13.06 Apply geometric construction techniques.	LAFS.910.W.4.10 LAFS.910.L.3.6 MAFS.912.G-CO.1.1, 2	
	13.07 Interpret information from drawings, prints, and sketches.	LAFS.910.W.4.10 LAFS.910.L.3.6 MAFS.912.N-Q.1.1, 3	
	13.08 Apply coordinate systems.	LAFS.910.W.4.10 LAFS.910.L.3.6 MAFS.912.A-REI.4.11	
	13.09 Produce and reproduce drawings using modern technical methods for drafting reproduction.	LAFS.910.W.4.10 LAFS.910.L.3.6 MAFS.912.N-Q.1.1, 3	
14.0	Demonstrate technical knowledge and skills for making basic orthographic drawings–The student will be able to:		
	14.01 Explain the theory of orthographic projection.	LAFS.910.W.2.6; 4.10 MAFS.912.G-SRT.1.2	
	14.02 Identify the six principal views of an object.	LAFS.910.W.2.6; 4.10 MAFS.912.G-SRT.1.2	
	14.03 Produce a three-view orthographic drawing using traditional drafting methods.	LAFS.910.W.2.6; 4.10 MAFS.912.G-SRT.1.2	
	14.04 Produce a three-view orthographic drawing using CAD software.	LAFS.910.W.2.6; 4.10 MAFS.912.G-SRT.1.2	
15.0	Demonstrate technical knowledge and skills for making pictorial drawings–The student will be able to:		
	15.01 Explain methods of pictorial drawing.	LAFS.910.W.2.6; 4.10 MAFS.912.G-CO.1.1	
	15.02 Produce an isometric drawing using traditional drafting methods.	LAFS.910.W.2.6; 4.10 MAFS.912.G-CO.1.1	
	15.03 Produce an isometric drawing using CAD software.	LAFS.910.W.2.6; 4.10 MAFS.912.G-CO.1.1, 2	

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	15.04 Produce an oblique drawing using traditional drafting methods.	LAFS.910.W.2.6; 4.10 MAFS.912.G-CO.1.1	
	15.05 Produce an oblique drawing using CAD software.	LAFS.910.W.2.6; 4.10 MAFS.912.G-CO.1.1, 2	
	15.06 Produce a perspective drawing using traditional drafting methods.	LAFS.910.W.2.6; 4.10 MAFS.912.G-CO.1.1	
	15.07 Produce a perspective drawing using CAD software.	LAFS.910.W.2.6; 4.10 MAFS.912.G-CO.1.1, 2	
16.0	Demonstrate technical knowledge and skills for making auxiliary view drawings–The student will be able to:		
	16.01 Explain terminology and concepts associated with auxiliary view drawings.	LAFS.910.W.2.6; 4.10 MAFS.912.G-CO.1.2, 5	
	16.02 Produce an auxiliary view drawing using traditional drafting methods.	LAFS.910.W.2.6; 4.10 MAFS.912.G-CO.1.2, 5	
	16.03 Produce an auxiliary view drawing using CAD software.	LAFS.910.W.2.6; 4.10 MAFS.912.G-CO.1.2, 5	
	16.04 Develop a pattern using surface development techniques.	LAFS.910.W.2.6; 4.10 MAFS.912.G-CO.1.2, 5	
17.0	Demonstrate technical knowledge and skills for making sectional view drawings–The student will be able to:		
	17.01 Define sectional view and types of sectional views.	LAFS.910.W.2.6; 4.10 MAFS.912.G-GMD.2.4	
	17.02 Illustrate the types of breaks and symbols used in drawing sectional views.	LAFS.910.W.2.6; 4.10 MAFS.912.G-GMD.2.4	
	17.03 Produce a sectional view drawing using traditional drafting methods.	LAFS.910.W.2.6; 4.10 MAFS.912.G-GMD.2.4	
	17.04 Produce a sectional view drawing using CAD software.	LAFS.910.W.2.6; 4.10 MAFS.912.G-GMD.2.4	
18.0	Demonstrate technical knowledge and skills for making working drawings–The student will be able to:		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	18.01 Produce detailed machine drawings.	LAFS.910.W.2.6; 4.10 MAFS.912.G-CO.1.1, 2, 5	
	18.02 Produce detailed assembly drawings.	LAFS.910.W.2.6; 4.10 MAFS.912.G-CO.1.1, 2, 5	
	18.03 Produce a technical illustration.	LAFS.910.W.2.6; 4.10 MAFS.912.G-CO.1.1, 2, 5	
19.0	Demonstrate technical knowledge and skills for making a basic residential drawing–The student will be able to:		
	19.01 Produce a dimensioned floor plan.	LAFS.910.W.2.6; 4.10 MAFS.912.G-SRT.1.1	
	19.02 Produce dimensioned elevation drawings.	LAFS.910.W.2.6; 4.10 MAFS.912.G-SRT.1.1	
20.0	Identify computer components and their functions–The student will be able to:		
	20.01 Identify the internal components of a computer (e.g., power supply, hard drive, mother board, I/O cards/ports, cabling, etc.).	LAFS.910.L.3.6	SC.912.N.1.1
	20.02 Identify various computer input devices (e.g., mouse, keyboard, phone, camera) and describe their use.	LAFS.910.L.3.6	SC.912.N.1.1
	20.03 Identify various computer output devices (e.g., monitor, printer, phone) and describe their use.	LAFS.910.L.3.6	SC.912.N.1.1
	20.04 Identify various storage devices (e.g., flash drive, iPod, phone, external hard drive, etc.)	LAFS.910.L.3.6	SC.912.N.1.1
21.0	Demonstrate proficiency with common computer peripherals, including connections to standard input and output devices–The student will be able to:		
	21.01 Identify the types and purposes of common input devices (e.g., mouse, keyboard, camera, microphone, scanner).	LAFS.910.SL.1.2	SC.912.N.1.1
	21.02 Identify the types and purposes of specialized input devices (e.g., digital cameras, mobile devices, GPS devices).	LAFS.910.SL.1.2	SC.912.N.1.1
	21.03 Describe the types and purposes of various computer connections (e.g., USB, firewire, parallel, serial, Ethernet, WiFi, et al).	LAFS.910.SL.1.2	SC.912.N.1.1
	21.04 Connect an input device (e.g., mouse, keyboard, cell phone, camera, et al) and verify proper operation.	LAFS.910.RI.1.3; 2.4	SC.912.N.1.1
	21.05 Connect an output device (e.g., printer, monitor, projector, et al) and verify proper operation.	LAFS.910.RI.1.3; 2.4	SC.912.N.1.1

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
22.0	Demonstrate knowledge of computer file management–The student will be able to:		
22.01	Describe and use conventional file naming conventions.	LAFS.910.SL.1.2 LAFS.910.RI.1.3	
22.02	Demonstrate proficiency with file management tasks (e.g., folder creation, file creation, backup, copy, delete, open, save).	LAFS.910.RI.1.3	
22.03	Be able to identify file types by extension (e.g., .doc, .txt, .wav, xls, etc.).	LAFS.910.SL.1.2 LAFS.910.RI.1.3	
23.0	Demonstrate proficiency using the Internet to locate information–The student will be able to:		
23.01	Identify and use web terminology.	LAFS.910.L.3.6 LAFS.910.W.2.6	
23.02	Define Universal Resource Locators (URLs) and associated protocols (e.g., http, ftp, telnet, mailto).	LAFS.910.L.3.6	
23.03	Compare and contrast the types of Internet domains (e.g., .com, .org, .edu, .gov, .net, .mil).	LAFS.910.L.3.6	
23.04	Demonstrate proficiency using search engines, including Boolean search techniques.	LAFS.910.L.3.6 LAFS.910.W.2.6	
23.05	Apply the rules for properly citing works or other information obtained from the Internet.	LAFS.910.L.3.6	
23.06	Identify and apply Copyright Fair Use guidelines.	LAFS.910.L.3.6	
23.07	Evaluate online information for credibility and quality using basic guidelines and indicators (e.g. authority, affiliation, purpose, etc.).	LAFS.910.L.3.6	SC.912.N.1.4
24.0	Demonstrate an understanding of Internet safety and ethics–The student will be able to:		
24.01	Describe cyber-bullying and its impact on perpetrators and victims.	LAFS.910.W.3.7, 8, 9	
24.02	Differentiate between viruses and malware, specifically their sources, ploys, and impact on personal privacy and computer operation, and ways to avoid infection.	LAFS.910.W.3.7, 8, 9	
24.03	Demonstrate proficiency running an antivirus scan to remove viruses and malware.	LAFS.910.W.3.7, 8, 9	
24.04	Describe risks associated with social networking sites (e.g., FaceBook, MySpace, and Twitter) and ways to mitigate these risks.	LAFS.910.W.3.7, 8, 9	
24.05	Adhere to cyber safety practices with regard to conducting Internet searches, email, chat rooms, and other social network websites.	LAFS.910.W.3.7, 8, 9	
24.06	Adhere to Acceptable Use Policies when accessing the Internet.	LAFS.910.W.3.7, 8, 9	
25.0	Develop and apply word processing and document manipulation skills–The student will be able to:		
25.01	Apply and adjust margins, tabs, line spacing and paragraph indents.	LAFS.910.W.4.10	

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
25.02	Insert and manipulate text, graphics/images, and WordArt.	LAFS.910.W.4.10	
25.03	Format text using the font interface and styles interface.	LAFS.910.W.4.10	
25.04	Adjust the size, position, and layout wrapping settings of a graphic/image.	LAFS.910.W.4.10	
25.05	Use the status bar to determine the number of pages, words, and characters in a document.	LAFS.910.W.4.10	
25.06	Insert codes for current date and time.	LAFS.910.W.4.10	
25.07	Copy text between documents using mouse, menu, and keyboard techniques.	LAFS.910.W.4.10	
25.08	Move text in a document using mouse, menu, and keyboard techniques.	LAFS.910.W.4.10	
25.09	Create bulleted and numbered lists.	LAFS.910.W.4.10	
25.10	Create a table – Inserting, moving and entering data.	LAFS.910.W.4.10	
25.11	Create a table – format rows, columns and cells.	LAFS.910.W.4.10	
25.12	Insert page breaks.	LAFS.910.W.4.10	
25.13	Adjust magnification of document display single and multiple pages.	LAFS.910.W.4.10	
25.14	Understand printing options including shrink to fit, gutters, and document orientation.	LAFS.910.W.4.10	
25.15	Create a report or essay that contains a title page, text, a graphic/image, and WordArt.	LAFS.910.W.4.10	
26.0	Develop and apply fundamental spreadsheet skills–The student will be able to:		
26.01	Describe a spreadsheet and the ways in which it may be used.	LAFS.910.SL.2.4, 5	
26.02	Identify the parts of the spreadsheet display.	LAFS.910.W.4.10	
26.03	Insert and format text information into cells.	LAFS.910.W.4.10	
26.04	Insert and format numeric information into cells.	LAFS.910.W.4.10	
26.05	Insert and format date and time information into cells.	LAFS.910.W.4.10	
26.06	Select multiple cells using the mouse.	LAFS.910.W.4.10	
26.07	Copy information from one or more cells to another part of the spreadsheet.	LAFS.910.W.4.10	

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
26.08	Move information from one or more cells to another part of the spreadsheet.	LAFS.910.W.4.10	
26.09	Sum the numeric values of multiple cells.	LAFS.910.W.4.10	
26.10	Use the sort function to alphabetize a table of information.	LAFS.910.W.4.10	
26.11	Create and navigate through a worksheet.	LAFS.910.W.4.10	
26.12	Change column width and row height.	LAFS.910.W.4.10	
26.13	Insert columns and rows.	LAFS.910.W.4.10	
26.14	Merge cells.	LAFS.910.W.4.10	
26.15	Use Undo and Redo features.	LAFS.910.W.4.10	
26.16	Insert arithmetic formulas into a spreadsheet.	LAFS.910.W.4.10	
26.17	Create and print a table that displays and sums the quantities or values of different categories of data.	LAFS.910.W.4.10	
26.18	Create a chart based on data sets defined in a spreadsheet.	LAFS.910.W.4.10	
26.19	Adjust chart types to appropriately represent base data.	LAFS.910.W.4.10	
27.0	Demonstrate an understanding of color theory and its role in technical design–The student will be able to:		
27.01	Describe the spectral colors in the visible light spectrum.	LAFS.910.W.3.7	SC.912.P.10.18
27.02	Describe the difference between color and light.	LAFS.910.W.3.7	SC.912.P.10.18
27.03	Differentiate between spectral and primary colors.	LAFS.910.W.3.7	
27.04	Describe the difference between additive and subtractive color mixing.	LAFS.910.W.3.7	
27.05	Compare and contrast the RGB and CYMK color models as used in technical design.	LAFS.910.W.3.7	
27.06	Demonstrate knowledge in terms relating to color such as: chroma, lightness, saturation, hue, intensity, luminance/value, shade, tint, etc.	LAFS.910.L.3.6	
27.07	Demonstrate an understanding relating to the meanings of color (the psychology of color and the application of color in design).	LAFS.910.L.3.6	
27.08	Demonstrate a working knowledge and technical skills relating to Application of color theory to design practices.	LAFS.910.L.3.6	
28.0	Demonstrate an understanding of the elements and principles of graphic design–The student will be able to:		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
28.01	Describe the elements of graphic design (e.g., line, shape, mass, texture, color, lighting).	LAFS.910.L.3.6	
28.02	Describe the principles of graphic design (e.g., balance, unity, contrast, rhythm, proportion, scaling).	LAFS.910.L.3.6	
28.03	Distinguish between criteria and constraints for a given technical design problem.	LAFS.910.L.3.6	
29.0	Develop a design portfolio–The student will be able to:		
29.01	Identify the proper elements of a fully developed portfolio.	LAFS.910.W.2.6	
29.02	Identify and discuss the ethical issues surrounding portfolio artifacts.	LAFS.910.SL.1.1	
29.03	Create a design portfolio that is well organized and displays their work.	LAFS.910.W.2.5, 6	

Florida Department of Education
Student Performance Standards

Course Title: **Technical Design 2**
Course Number: **8401020**
Course Credit: **1**

Course Description:
In this course, students learn more about the nature of design and drafting techniques for architectural purposes. Students are also provided with instruction in a variety of technical illustrations commonly produced to depict architectural concepts and designs. Students are expected to continue collating their portfolio using exemplars of their work. As with previous portfolio pieces, each exemplar should include a narrative description of the item with an explanation of any special techniques used to create the item.

Florida Standards			Correlation to CTE Program Standard #
01.0	Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Technical Design.		
	01.01 Key Ideas and Details		
	01.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. LAFS.910.RST.1.1	
	01.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.910.RST.1.2	
	01.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.910.RST.1.3	
	01.02 Craft and Structure		
	01.02.1	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. LAFS.910.RST.2.4	
	01.02.2	Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). LAFS.910.RST.2.5	

Florida Standards			Correlation to CTE Program Standard #
	01.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. LAFS.910.RST.2.6	
01.03	Integration of Knowledge and Ideas		
	01.03.1	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. LAFS.910.RST.3.7	
	01.03.2	Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. LAFS.910.RST.3.8	
	01.03.3	Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. LAFS.910.RST.3.9	
01.04	Range of Reading and Level of Text Complexity		
	01.04.1	By the end of grade 9, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	01.04.2	By the end of grade 10, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 9–10 text complexity band independently and proficiently. LAFS.910.RST.4.10	
02.0	Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Technical Design.		
02.01	Text Types and Purposes		
	02.01.1	Write arguments focused on discipline-specific content. LAFS.910.WHST.1.1	
	02.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.910.WHST.1.2	
02.02	Production and Distribution of Writing		

Florida Standards			Correlation to CTE Program Standard #
	02.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.910.WHST.2.4	
	02.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.910.WHST.2.5	
	02.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. LAFS.910.WHST.2.6	
	02.03	Research to Build and Present Knowledge	
	02.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.910.WHST.3.7	
	02.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. LAFS.910.WHST.3.8	
	02.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.910.WHST.3.9	
	02.04	Range of Writing	
	02.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.910.WHST.4.10	
03.0	Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Technical Design.		
	03.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	

Florida Standards	Correlation to CTE Program Standard #
03.02 Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
03.03 Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
03.04 Model with mathematics. MAFS.K12.MP.4.1	
03.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
03.06 Attend to precision. MAFS.K12.MP.6.1	
03.07 Look for and make use of structure. MAFS.K12.MP.7.1	
03.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
30.0 Demonstrate an understanding of the various approaches used in problem solving–The student will be able to:		
30.01 Employ research and development processes to assess the functional, economic, and ethical viability of a product or prototype.	LAFS.910.W.1.1	SC.912.N.1.1, 4
30.02 Research a problem and determine the most appropriate problem-solving method to employ.	LAFS.910.W.3.7, 8, 9	SC.912.N.1.1, 4
30.03 Determine whether the solution to a specific problem is technology-based.	LAFS.910.W.3.7, 8, 9	SC.912.N.1.1
30.04 Utilize a multidisciplinary approach to solving technological problems.	LAFS.910.W.3.7, 8, 9	SC.912.N.1.1
31.0 Demonstrate abilities to apply the design process–The student will be able to:		
31.01 Determine whether an illustrative design problem is worthy of being resolved or addressed.	LAFS.910.W.1.1; 3.7, 8, 9	
31.02 Identify the criteria and constraints associated with an illustrative design problem and select the most appropriate solution based on these factors.	LAFS.910.SL.2.4	
31.03 Evaluate the quality, efficiency, and productivity of an existing or proposed design and refine the design accordingly.	LAFS.910.SL.1.1, 2, 3	SC.912.P.10.8

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
31.04	Evaluate an existing design using conceptual, physical, and mathematical models and note aspects for improvement.	LAFS.910.SL.1.1, 2, 3	SC.912.N.1.1
31.05	Design and develop an illustrative design solution using the design process.	LAFS.910.W.4.10	
31.06	Create and deliver a slide presentation to communicate the design process and final solution to an illustrative or technical design problem.	LAFS.910.SL.2.4	
32.0	Create architectural drawings to industry standards–The student will be able to:		
32.01	Produce a dimensioned floor plan showing walls, windows, doors, cabinets, stairs, appliances, fixtures, and other details.	LAFS. 910.W.4.10 MAFS.912.G-SRT.1.1	SC.912.N.1.1
32.02	Produce a dimensioned foundation plan with details.	LAFS. 910.W.4.10 MAFS.912.G-SRT.1.1	SC.912.N.1.1
32.03	Produce an architectural electrical plan.	LAFS. 910.W.4.10 MAFS.912.G-SRT.1.1	
32.04	Produce an architectural plumbing plan.	LAFS. 910.W.4.10 MAFS.912.G-SRT.1.1	
32.05	Produce an architectural climate control plan (HVAC).	LAFS. 910.W.4.10 MAFS.912.G-SRT.1.1	
32.06	Produce a dimensioned roof plan with details.	LAFS. 910.W.4.10 MAFS.912.G-SRT.1.1	
32.07	Produce a detailed information sheet including wall section and schedules.	LAFS. 910.W.4.10 MAFS.912.G-SRT.1.1	
32.08	Produce a dimensioned plot plan.	LAFS. 910.W.4.10 MAFS.912.G-SRT.1.1	
32.09	Produce dimensioned elevation drawings showing grade lines, floors, ceilings, windows, doors, and other details.	LAFS. 910.W.4.10 MAFS.912.G-SRT.1.1	
33.0	Create a reverse engineered drawing (as built) from a solid object–The student will be able to:		
33.01	Identify and apply advanced measuring tools and techniques.	LAFS. 910.RI.3.7 MAFS.912.N-Q.1.1, 3	SC.912.N.1.1
33.02	Apply precision dimensioning standards.	LAFS. 910.RI.3.7 MAFS.912.G-CO.1.1	SC.912.N.1.1

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	33.03 Produce a detailed multi view orthographic drawing.	LAFS. 910.W.4.10 MAFS.912.G-SRT.1.2	
	33.04 Produce an enhanced pictorial drawing.	LAFS. 910.W.4.10 MAFS.912.G-CO.1.1	
	33.05 Produce an auxiliary view drawing.	LAFS. 910.W.4.10 MAFS.912.G-CO.1.1	
	33.06 Produce a section view drawing.	LAFS. 910.W.4.10 MAFS.912.G-GMD.2.4	
34.0	Create technical illustrations–The student will be able to:		
	34.01 Produce a colored or shaded pictorial rendering for presentation.	LAFS. 910.W.4.10	
	34.02 Produce a labeled graph or chart for display.	LAFS. 910.W.4.10	
35.0	Demonstrate proficiency in using presentation software–The student will be able to:		
	35.01 Describe presentation software and the ways in which it may be used.	LAFS. 910.SL.2.4	
	35.02 Create a Slide Master.	LAFS. 910.SL.2.4	
	35.03 Adjust presentation format using the Slide Master.	LAFS. 910.SL.2.5	
	35.04 Add and format titles, subtitles, and talking points to a presentation slide.	LAFS. 910.SL.2.5	
	35.05 Insert date and time codes and slide numbers to slides.	LAFS. 910.SL.2.5	
	35.06 Insert and format images/graphics onto slides.	LAFS. 910.SL.2.5	
	35.07 Insert new or duplicate slides.	LAFS. 910.SL.2.5	
	35.08 Adjust slide transition to include animation.	LAFS. 910.SL.2.5	
	35.09 Insert and adjust sound settings and timing in presentation.	LAFS. 910.SL.2.5	
	35.10 Adjust the sequence of slides in the presentation.	LAFS. 910.SL.2.5	
	35.11 Produce a presentation that includes text, graphics, and digital images and present it using a projection system.	LAFS. 910.SL.2.5	SC.912.N.1.1
	35.12 Adjust Slide Show Set-up to loop show continuously.	LAFS. 910.SL.2.5	
36.0	Create technical illustrations using illustration software applications–The student will be able to:		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
36.01	Demonstrate proficiency in the use of common functions and features of illustration software.	LAFS. 910.W.2.6	SC.912.N.1.1
36.02	Prepare images using illustration software.	LAFS. 910.W.4.10	
36.03	Demonstrate technical skill and knowledge in the composition of a technical illustration.	LAFS. 910.W.4.10	
36.04	Demonstrate proficiency in manipulating a technical illustration to achieve a desired result.	LAFS. 910.W.4.10	
37.0	Create technical drawings using software applications–The student will be able to:		
37.01	Demonstrate proficiency in the use of common functions and features of technical drawing software.	LAFS. 910.L.3.6	
37.02	Prepare technical drawings using CAD software.	LAFS. 910.W.2.6; 4.10	
37.03	Create technical drawings according to technical design specifications.	LAFS. 910.W.4.10	
37.04	Apply rendering techniques as appropriate.	LAFS. 910.W.4.10	
38.0	Maintain a design portfolio–The student will be able to:		
38.01	Select appropriate items for showcasing in a design portfolio.	LAFS. 910.W.3.7, 8	
38.02	Modify/adjust a design portfolio to accommodate additional exemplars.	LAFS. 910.W.37, 8	
39.0	Demonstrate technical writing skills–The student will be able to:		
39.01	Create a resume highlighting technical skills for non-technical readers.	LAFS. 910.W.2.4, 5, 6; 3.7, 8	
39.02	Write a proposal for a technical project.	LAFS. 910.W.2.4, 5, 6; 3.7, 8	
39.03	Draft an Engineering Change Order/Request.	LAFS.910.W.2.5	
39.04	Interpret revisions to technical drawings that have been made according to standard change symbols.	LAFS.910.W.2.5	

Florida Department of Education
Student Performance Standards

Course Title: **Technical Design 3**
Course Number: **8401030**
Course Credit: **1**

Course Description:
In addition to exploring the implications of applying technologies, this course provides students with instruction in advanced imaging techniques relative to both static and animated illustrations. In addition to learning more advanced techniques, students will have an opportunity to research a project, design an appropriate solution, and present their results. The ultimate output of this course is the student's presentation of a completed portfolio illustrating their best exemplars. The portfolio should include a narrative description of the scenario, the approach to data collection, resulting renderings, and an interpretation of each chart/graph. Research references should be cited appropriately. Given the advanced nature of this course, students should be encouraged to produce the portfolio using presentation software suitable for dissemination via the Internet.

Florida Standards			Correlation to CTE Program Standard #
40.0	Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Technical Design.		
	40.01 Key Ideas and Details		
	40.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. LAFS.1112.RST.1.1	
	40.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.1112.RST.1.2	
	40.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.1112.RST.1.3	
	40.02 Craft and Structure		
	40.02.1	Determine the meaning of symbols key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. LAFS.1112.RST.2.4	

Florida Standards			Correlation to CTE Program Standard #
	40.02.2	Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. LAFS.1112.RST.2.5	
	40.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. LAFS.1112.RST.2.6	
40.03	Integration of Knowledge and Ideas		
	40.03.1	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g. quantitative data, video, multimedia) in order to address a question or solve a problem. LAFS.1112.RST.3.7	
	40.03.2	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. LAFS.1112.RST.3.8	
	40.03.3	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. LAFS.1112.RST.3.9	
40.04	Range of Reading and Level of Text Complexity		
	40.04.1	By the end of grade 11, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	40.04.2	By the end of grade 12, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 11–CCR text complexity band independently and proficiently. LAFS.1112.RST.4.10	
41.0	Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Technical Design.		
41.01	Text Types and Purposes		
	41.01.1	Write arguments focused on discipline-specific content. LAFS.1112.WHST.1.1	

Florida Standards		Correlation to CTE Program Standard #
41.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.1112.WHST.1.2	
41.02	Production and Distribution of Writing	
41.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.1112.WHST.2.4	
41.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.1112.WHST.2.5	
41.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. LAFS.1112.WHST.2.6	
41.03	Research to Build and Present Knowledge	
41.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.1112.WHST.3.7	
41.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. LAFS.1112.WHST.3.8	
41.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.1112.WHST.3.9	
41.04	Range of Writing	
41.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.1112.WHST.4.10	

Florida Standards		Correlation to CTE Program Standard #
42.0	Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Technical Design.	
42.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	
42.02	Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
42.03	Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
42.04	Model with mathematics. MAFS.K12.MP.4.1	
42.05	Use appropriate tools strategically. MAFS.K12.MP.5.1	
42.06	Attend to precision. MAFS.K12.MP.6.1	
42.07	Look for and make use of structure. MAFS.K12.MP.7.1	
42.08	Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
43.0	Demonstrate an understanding of the cultural, social, economic, and political effects of technology–The student will be able to:		
43.01	Discuss changes caused by the use of technology ranging from gradual to rapid and from subtle to obvious.	LAFS.1112.SL.1.1	SC.912.N.4.1, 2
43.02	Evaluate the use of technology involving weighing the trade-offs between the positive and negative effects.	LAFS.1112.SL.1.1	SC.912.N.4.1, 2
43.03	Debate the cultural, social, economic, and political changes caused by the transfer of technology from one society to another.	LAFS.1112.W.3.7, 8, 9	SC.912.N.4.1, 2
44.0	Demonstrate the abilities to use and maintain technological products and systems–The student will be able to:		
44.01	Document processes and procedures and communicate them to different audiences using appropriate oral and written techniques.	LAFS.1112.SL.1.1 LAFS.1112.W.2.4, 5, 6	SC.912.N.1.1
44.02	Diagnose a system that is malfunctioning and use tools, materials, machines, and knowledge to repair it.	LAFS.1112.W.3.7, 8, 9	SC.912.N.1.1

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	44.03 Troubleshoot, analyze, and maintain systems to ensure safe and proper function and precision.	LAFS.1112.W.3.7, 8, 9	SC.912.N.1.1
	44.04 Operate systems so that they function in the way they were designed.	LAFS.1112.W.3.7, 8, 9	SC.912.N.1.1
	44.05 Use computers and calculators to access, retrieve, organize process, maintain, interpret, and evaluate data and information in order to communicate.	LAFS.1112.W.2.6	SC.912.N.1.1
45.0	Demonstrate the abilities to assess the impact of products and systems–The student will be able to:		
	45.01 Collect information and evaluate its quality.	LAFS.1112.W.3.7, 8, 9 MAFS.912.S-ID.2.5	SC.912.N.1.1
	45.02 Synthesize data, analyze trends, and draw conclusions regarding the effect of technology on the individual, society, and environment.	LAFS.1112.W.3.7, 8, 9 MAFS.912.S-ID.2.5	SC.912.N.1.1; 4.1
	45.03 Apply assessment techniques, such as trend analysis and experimentation to make decisions about the future development of technology.	LAFS.1112.W.4.10	SC.912.N.1.1
	45.04 Design forecasting techniques to evaluate the results of altering natural systems.	LAFS.1112.W.4.10	SC.912.N.1.1
46.0	Demonstrate technical knowledge and skills for making engineering drawings–The student will be able to:		
	46.01 Produce an advanced detailed machine drawing with tolerances, hidden surfaces and other mechanical details.	LAFS.1112.W.2.6; 4.10 MAFS.912.G-CO.1.1, 2, 5	
	46.02 Produce detailed electrical and electronic schematics with appropriate components.	LAFS.1112.W.2.6; 4.10 MAFS.912.G-CO.1.1, 2, 5	
	46.03 Produce a contour map with a cut and fill drawing annotated in accordance with government codes.	LAFS.1112.W.2.6; 4.10 MAFS.912.G-CO.1.1, 2, 5	
47.0	Demonstrate and present a research and design project–The student will be able to:		
	47.01 Identify and research a design problem related to one of the following technologies (medical, GIS, agriculture, energy & power, information & communication, transportation, manufacturing, and construction).	LAFS.1112.L.3.6	SC.912.N.1.1
	47.02 Identify criteria and constraints.	LAFS.1112.L.3.6	SC.912.N.1.1
	47.03 Produce a virtual or physical model of the solution.	LAFS.1112.W.2.6; 4.10	SC.912.N.1.1
	47.04 Test and evaluate the solution.	LAFS.1112.RI.3.8	SC.912.N.1.1
	47.05 Deliver a professional quality presentation of the design process and solution (e.g., a rendering, 3D model, walk-through, fly-over, or animation of a design).	LAFS.1112.W.2.6; 4.10	SC.912.N.1.1

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
48.0	Demonstrate an understanding of career opportunities and requirements in the field of drafting/illustrative design technology–The student will be able to:		
48.01	Discuss individual interests related to a career in drafting/illustrative design technology.	LAFS.1112.SL.1.1	
48.02	Explore career opportunities related to a career in drafting/illustrative design technology.	LAFS.1112.W.3.7, 8, 9; 4.10	
48.03	Explore secondary education opportunities related to drafting/illustrative design technology.	LAFS.1112.W.3.7, 8, 9; 4.10	
48.04	Conduct a job search.	LAFS.1112.W.3.7, 8, 9; 4.10	
48.05	Complete a job application form correctly.	LAFS.1112.W.3.7, 8, 9; 4.10	
48.06	Demonstrate competence in job interview techniques.	LAFS.1112.W.3.7, 8, 9; 4.10	
48.07	Create a professional resume and letter of introduction.	LAFS.1112.W.3.7, 8, 9; 4.10	
48.08	Solicit awards, letters of recommendation and recognition.	LAFS.1112.W.3.7, 8, 9; 4.10	
48.09	Organize work samples in a professional, presentable format.	LAFS.1112.W.3.7, 8, 9; 4.10	
49.0	Demonstrate familiarity with techniques associated with digital photorealism–The student will be able to:		
49.01	Describe digital photorealism and its role in technical design.	LAFS.1112.W.3.7, 8, 9 LAFS.1112.L.3.6	
49.02	Describe techniques that infuse photorealism into 3D drawings (e.g., beveling, gamma corrections, photometric lighting, depth of field, chromatic aberration, specular maps, texturing, and asymmetry).	LAFS.1112.W.3.7, 8, 9 LAFS.1112.L.3.6	SC.912.P.10.18
49.03	Use advanced functions in illustration software used to achieve photorealism.	LAFS.1112.W.3.7, 8, 9 LAFS.1112.L.3.6	
50.0	Create complex technical drawings using appropriate software applications–The student will be able to:		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
50.01	Demonstrate proficiency in the use of advanced functions and features of technical drawing software.	LAFS.1112.W.4.10 LAFS.1112.L.3.6 MAFS.912.G-CO.4.12 MAFS.912.A-REI.4.11	SC.912.N.1.1
50.02	Prepare complex technical drawings using CAD or 3D illustration software.	LAFS.1112.W.4.10 LAFS.1112.L.3.6 MAFS.912.G-GMD.2.4	SC.912.N.1.1
50.03	Integrate special effects into complex 3D technical drawings.	LAFS.1112.W.4.10 LAFS.1112.L.3.6 MAFS.912.G-MD.2.4	SC.912.N.1.1
50.04	Create complex technical drawings according to technical design specifications.	LAFS.1112.W.4.10 LAFS.1112.L.3.6	SC.912.N.1.1
50.05	Apply advanced rendering techniques as appropriate.	LAFS.1112.W.4.10 LAFS.1112.L.3.6	SC.912.N.1.1
51.0	Prepare and present a design portfolio–The student will be able to:		
51.01	Select appropriate items for showcasing in a design portfolio.	LAFS.1112.W.3.7, 8	
51.02	Modify/adjust a design portfolio to accommodate additional exemplars.	LAFS.1112.W.2.4, 5, 6	

Additional Information

Laboratory Activities

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

Career and Technical Student Organization (CTSO)

The Florida Technology Student Association (FL-TSA) is the intercurricular career and technical student organization for providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

Cooperative Training – OJT

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

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 Occupational Completion Point (OCP) or a Modified Occupational Completion Point (MOCP). If needed, a student may enroll in the same career and technical course more than once. Documentation should be included in the IEP that clearly indicates that it is anticipated that the student may need an additional year to complete an OCP/MOCP. The student should work on different competencies and new applications of competencies each year toward completion of the OCP/MOCP. After achieving the competencies identified for the year, the student earns credit for the course. It is important to ensure that credits earned by students are reported accurately. The district's information system must be designed to accept multiple credits for the same course number for eligible students with disabilities.

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

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, 30, 31
Standard Length	3 credits
Teacher Certification	TEC ED 1 @2 ENG @7 7G ENG TEC 7G
CTSO	Florida Technology Student Association (FL-TSA)
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 one-credit courses. The following table illustrates the program structure:

Course Number	Course Title	Length	Level	Graduation Requirement
8401110	Applied Engineering Technology I	1 credit	3	PA
8401120	Applied Engineering Technology II	1 credit	3	VO
8401130	Applied Engineering Technology III	1 credit	3	PA

(Graduation Requirement Abbreviations- EQ= Equally Rigorous Science, PA= Practical Arts, EC= Economics, VO= Career and Technical Education)

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.

Academic Alignment Table

Academic alignment is an ongoing, collaborative effort of professional educators specializing in the fields of science, mathematics, English/language arts, and Career and Technical Education (CTE). This initiative supports CTE programs by improving student performance through the integration of academic content within CTE courses. Career and Technical Education courses that have been aligned to the Next Generation Sunshine State Standards for Science and the Florida Standards for Mathematics and English/Language Arts will show the following data: the quantity of academic standards in the CTE course; the total number of standards contained in the academic course; and the percentage of alignment to the CTE course.

Courses	Anatomy/ Physiology Honors	Astronomy Solar/Galactic Honors	Biology 1	Chemistry 1	Earth-Space Science	Environmental Science	Genetics	Integrated Science	Marine Science 1 Honors	Physical Science	Physics 1
8401110	**	**	**	**	**	**	**	**	**	**	**
8401120	**	**	**	**	**	**	**	**	**	**	**
8401130	**	**	**	**	**	**	**	**	**	**	**

** *Alignment pending review* # *Alignment attempted, but no correlation to academic course*

Courses	Algebra 1	Algebra 2	Geometry	English 1	English 2	English 3	English 4
8401110	**	**	**	**	**	**	**
8401120	**	**	**	**	**	**	**
8401130	**	**	**	**	**	**	**

** *Alignment pending review* # *Alignment attempted, but no correlation to academic course*

Florida Standards for Technical Subjects

Florida Standards (FS) for English Language Arts and Literacy in History/Social Studies, Science, and Technical Subjects are the critical reading and writing literacy standards designed for grade 6 and above. These standards are predicated on teachers of history/social studies, science, and technical subjects using their content area expertise to help students meet the particular challenges of reading, writing, speaking, listening, and language in their respective fields. It is important to note that the 6-12 literacy standards in history/social studies, science, and technical subjects are not meant to replace content standards in those areas but rather to supplement them.

This curriculum framework incorporates the grades 9-10 reading and writing literacy standards in the first two courses of this CTE program and grade 11-12 reading and writing literacy standards in the third and fourth courses of this CTE program. The standards for Mathematical Practices describe varieties of expertise that educators at all levels should seek to develop in their students. These practices rest on important "processes and proficiencies" with longstanding importance in mathematics education. This curriculum framework incorporates the appropriate mathematical practices in the first four courses of this CTE program.

Common Career Technical Core – Career Ready Practices

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

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

2. Apply appropriate academic and technical skills.

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

4. Communicate clearly, effectively and with reason.

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

6. Demonstrate creativity and innovation.

7. Employ valid and reliable research strategies.

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

9. Model integrity, ethical leadership and effective management.

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

11. Use technology to enhance productivity.

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

Standards

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

01.0 Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Applied Engineering Technology.
02.0 Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Applied Engineering Technology.
03.0 Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Applied Engineering Technology.
04.0 Demonstrate an understanding of the characteristics and scope of technology.
05.0 Demonstrate an understanding of the core concepts of technology.
06.0 Demonstrate an understanding of the attributes of design.
07.0 Demonstrate an understanding of the engineering design process.
08.0 Describe the functional characteristics of the engineering design team.
09.0 Demonstrate computer-aided design knowledge and skills.
10.0 Demonstrate foundational knowledge and skills associated with the design of a mechanical system.
11.0 Demonstrate technical knowledge and skills for machining.
12.0 Demonstrate foundational technical knowledge and skills associated with the design of fluid systems.
13.0 Demonstrate foundational technical knowledge and skills associated with the design of thermal systems.
14.0 Demonstrate foundational knowledge and skills associated with the design of electrical and electronic systems.
15.0 Demonstrate technical knowledge and skills in the designing, engineering, and analysis of constructed works.
16.0 Identify computer components and their functions.
17.0 Demonstrate proficiency with common computer peripherals, including connections to standard input and output devices.
18.0 Demonstrate knowledge of computer file management.
19.0 Demonstrate proficiency using the Internet to locate information.
20.0 Demonstrate an understanding of Internet safety and ethics.
21.0 Develop and apply word processing and document manipulation skills.
22.0 Develop and apply fundamental spreadsheet skills.
23.0 Demonstrate safe and appropriate use of tools.
24.0 Demonstrate an understanding of the various approaches used in problem solving.
25.0 Demonstrate the abilities to apply the design process.
26.0 Demonstrate proficiency in using presentation software.
27.0 Perform advanced study and technical skills related to engineering technology.
28.0 Demonstrate fundamental math and science knowledge and skills for mechanical systems.
29.0 Demonstrate technical knowledge and skills for fluid systems.
30.0 Demonstrate technical knowledge and skills for thermal systems.
31.0 Demonstrate technical knowledge and skills associated with the design of electrical and electronic systems.
32.0 Demonstrate safe and appropriate use of basic tools and machines.
33.0 Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Applied Engineering Technology.

34.0 Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Applied Engineering Technology.
35.0 Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Applied Engineering Technology.
36.0 Demonstrate an understanding of the cultural, social, economic, and political effects of technology.
37.0 Demonstrate an understanding of the effects of technology on the environment.
38.0 Demonstrate the abilities to assess the impact of products and systems.
39.0 Successfully work as a member of a team.
40.0 Plan, organize, and carry out a project plan.
41.0 Manage resources.
42.0 Use tools, materials, and processes in an appropriate and safe manner.

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

Electrical Engineering Discipline
43.0 Demonstrate an understanding of design and development of solutions involving electrical engineering, their environments, and their associated design constraints.
44.0 Design and build a mechanically engineered solution suitable for a particular application in a defined environment.

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

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

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.

Florida Standards			Correlation to CTE Program Standard #
01.0	Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Applied Engineering Technology.		
	01.01 Key Ideas and Details		
	01.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. LAFS.910.RST.1.1	
	01.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.910.RST.1.2	
	01.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.910.RST.1.3	
	01.02 Craft and Structure		
	01.02.1	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. LAFS.910.RST.2.4	
	01.02.2	Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). LAFS.910.RST.2.5	

Florida Standards			Correlation to CTE Program Standard #
	01.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. LAFS.910.RST.2.6	
01.03	Integration of Knowledge and Ideas		
	01.03.1	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. LAFS.910.RST.3.7	
	01.03.2	Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. LAFS.910.RST.3.8	
	01.03.3	Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. LAFS.910.RST.3.9	
01.04	Range of Reading and Level of Text Complexity		
	01.04.1	By the end of grade 9, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	01.04.2	By the end of grade 10, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 9–10 text complexity band independently and proficiently. LAFS.910.RST.4.10	
02.0	Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Applied Engineering Technology.		
02.01	Text Types and Purposes		
	02.01.1	Write arguments focused on discipline-specific content. LAFS.910.WHST.1.1	
	02.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.910.WHST.1.2	
02.02	Production and Distribution of Writing		

Florida Standards			Correlation to CTE Program Standard #
	02.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.910.WHST.2.4	
	02.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.910.WHST.2.5	
	02.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. LAFS.910.WHST.2.6	
	02.03	Research to Build and Present Knowledge	
	02.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.910.WHST.3.7	
	02.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. LAFS.910.WHST.3.8	
	02.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.910.WHST.3.9	
	02.04	Range of Writing	
	02.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.910.WHST.4.10	
03.0	Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Applied Engineering Technology.		
	03.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	

Florida Standards	Correlation to CTE Program Standard #
03.02 Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
03.03 Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
03.04 Model with mathematics. MAFS.K12.MP.4.1	
03.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
03.06 Attend to precision. MAFS.K12.MP.6.1	
03.07 Look for and make use of structure. MAFS.K12.MP.7.1	
03.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
04.0 Demonstrate an understanding of the characteristics and scope of technology. – The student will be able to:		
04.01 Discuss the nature and development of technological knowledge and processes.		
04.02 Explain the rapid increase in the rate of technological development and diffusion.		
04.03 Conduct specific goal-directed research related to inventions and innovations.		
04.04 Discuss current technological developments that are/were driven by profit motive and the market.		
04.05 Explain how technological progress promotes advancement of science and mathematics.		
04.06 Describe ways in which technology helps to shape social, cultural, political, and economic aspects of society.		
04.07 Describe how the development of many tools and machines were based more on technological know-how rather than scientific knowledge.		
05.0 Demonstrate an understanding of the core concepts of technology. – The student will be able to:		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
05.01	Explain systems thinking and the relationship between logic, creativity, and compromise in solving complex problems.		
05.02	Describe technological systems and their role within larger technological, social, and environmental systems.		
05.03	Describe the trade-offs between competing values (e.g., availability, cost, desirability, waste, et al) in the selection of resources.		
05.04	Identify the criteria and constraints of a product or system and determine how they affect the final design and development.		
05.05	List strategies for optimizing a technological process or methodology of designing or making a product, dependent on criteria and constraints.		
05.06	Identify new technologies that create new processes.		
05.07	Describe a quality control process to ensure that a product, service or system meets established criteria.		
05.08	Describe management and associated dynamics as they relate to technological development.		
06.0	Demonstrate an understanding of the attributes of design. – The student will be able to:		
06.01	Describe the essential activities that comprise the design process.		
06.02	Write a problem statement in sufficient clarity to enable design goals, requirements, and constraints to be identified.		
06.03	Critique the design of a solution and revise the design as needed.		
06.04	Explain how a design's criteria, constraints, and efficiency can compete with each other.		
06.05	Identify the factors that ensure the sustainability of an engineering design.		
06.06	Identify safety considerations when designing a product.		
07.0	Demonstrate an understanding of the engineering design process. – The student will be able to:		
07.01	Describe the sequence of steps and associated activities involved in applying the engineering design process.		
07.02	Compare and contrast creative and analytic problem-solving strategies to the engineering design process.		
07.03	Discuss why the engineering design process must begin with a clearly stated problem.		
07.04	Explain the relationship between design criteria and design constraints.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
07.05	Demonstrate brainstorming techniques.		
07.06	Describe the role of computer and mathematical models in the engineering design process.		
07.07	Explain the forms of analysis used in evaluating potential solutions, particularly those forms associated with engineering principles, estimation, economics, and worst case scenario.		
07.08	Describe a decision table and how it is used to evaluate proposed solutions to an engineering problem.		
08.0	Describe the functional characteristics of the engineering design team. – The student will be able to:		
08.01	Describe how work breakdown structure (WBS) impacts the makeup and organization of an engineering design team.		
08.02	Compare functional and hierarchical schemes for organizing an engineering design team.		
08.03	Describe the function of management in general and project management in particular.		
08.04	Describe a typical design project team structure.		
08.05	Outline a research methodology.		
08.06	Explain the role of ethics as a part of responsible decision making.		
09.0	Demonstrate computer-aided design knowledge and skills. – The student will be able to:		
09.01	Create an orthographic drawing using a CAD software platform.		
09.02	Create a part using a solid modeling CAD software platform.		
09.03	Create an assembly using a solid modeling CAD software platform.		
09.04	Create a bill of materials generated from a CAD application.		
10.0	Demonstrate foundational knowledge and skills associated with the design of a mechanical system. – The student will be able to:		
10.01	Measure and calculate dimensions of parts using metric and customary systems.		
10.02	Define and calculate quantities involving mass, weight, force, torque, friction, and resistance.		
10.03	Identify simple machines.		
10.04	Calculate mechanical advantage.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
10.05	Assemble, operate, and identify the parts of a mechanical system.		
11.0	Demonstrate technical knowledge and skills for machining. - The student will be able to:		
11.01	Measure dimensions using precision measurement tools, such as rulers, scales, calipers, and micrometers.		
11.02	Identify appropriate tools for machining purposes (e.g., drilling, turning, milling, sawing, and grinding).		
11.03	Explain steps for assembly and fabrication of products.		
12.0	Demonstrate foundational technical knowledge and skills associated with the design of fluid systems. – The student will be able to:		
12.01	Define and differentiate between absolute, gauge, and atmospheric pressure.		
12.02	Measure and calculate pressure and flow rate.		
12.03	Differentiate between pneumatics and hydraulics.		
12.04	Draw schematics for series, parallel, and combination circuits.		
13.0	Demonstrate foundational technical knowledge and skills associated with the design of thermal systems. – The student will be able to:		
13.01	Define and differentiate between heat and temperature.		
13.02	Describe the three laws of thermodynamics as they relate to the design of a thermal system.		
14.0	Demonstrate foundational knowledge and skills associated with the design of electrical and electronic systems. – The student will be able to:		
14.01	Compare and contrast basic electronic components (e.g., resistor, capacitor, transistor, coil, diode).		
14.02	Read schematics to identify individual values and function of component parts.		
14.03	Define and calculate quantities involving charge, voltage, current, resistance, impedance, inductance, and capacitance.		
14.04	Draw schematics for series, parallel, and combination circuits.		
14.05	Describe the differences between a series and a parallel circuit.		
14.06	Differentiate between alternating and direct current.		
14.07	Measure voltage, current, resistance, and capacitance using a multimeter.		
14.08	Define and calculate quantities using Ohm’s Law.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	14.09 Define and calculate quantities using Watt's Law.		
	14.10 Define and calculate quantities using Kirchhoff's voltage and current laws.		
	14.11 Solder electronic components.		
15.0	Demonstrate technical knowledge and skills in the designing, engineering, and analysis of constructed works. – The student will be able to:		
	15.01 Define terminology associated with engineering products and systems.		
	15.02 Define and describe the experimental method as it is applied to design.		
	15.03 Describe simulation.		
	15.04 Prepare a model of a design solution to an engineering problem.		
	15.05 Prepare a graphical solution to an engineering problem.		
	15.06 Prepare a mathematical solution to an engineering problem (using either a calculator or computer).		
	15.07 Present a technical report on an engineering design problem, concept or issue.		
16.0	Identify computer components and their functions. – The student will be able to:		
	16.01 Identify the internal components of a computer (e.g., power supply, hard drive, mother board, I/O cards/ports, cabling, etc.).		
	16.02 Identify various computer input devices (e.g., mouse, keyboard, phone, camera) and describe their use.		
	16.03 Identify various computer output devices (e.g., monitor, printer, phone) and describe their use.		
	16.04 Identify various storage devices (e.g., flash drive, iPod, phone, external hard drive, etc.)		
17.0	Demonstrate proficiency with common computer peripherals, including connections to standard input and output devices. – The student will be able to:		
	17.01 Identify the types and purposes of common input devices (e.g., mouse, keyboard, camera, microphone, scanner).		
	17.02 Identify the types and purposes of specialized input devices (e.g., digital cameras, mobile devices, GPS devices).		
	17.03 Describe the types and purposes of various computer connection ports (e.g., USB, firewire, parallel, serial, Ethernet, et al).		
	17.04 Connect an input device (e.g., mouse, keyboard, cell phone, camera, et al) and verify proper operation.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
17.05	Connect an output device (e.g., printer, monitor, projector, et al) and verify proper operation.		
18.0	Demonstrate knowledge of computer file management. – The student will be able to:		
18.01	Describe and use conventional file naming conventions.		
18.02	Demonstrate proficiency with file management tasks (e.g., folder creation, file creation, backup, copy, delete, open, save).		
18.03	Be able to identify file types by extension (e.g., .doc, .txt, .wav, xls, etc.).		
19.0	Demonstrate proficiency using the Internet to locate information. – The student will be able to:		
19.01	Identify and use web terminology.		
19.02	Define Universal Resource Locators (URLs) and associated protocols (e.g., http, ftp, telnet, mailto).		
19.03	Compare and contrast the types of Internet domains (e.g., .com, .org, .edu, .gov, .net, .mil).		
19.04	Demonstrate proficiency using search engines, including Boolean search techniques.		
19.05	Apply the rules for properly citing works or other information obtained from the Internet.		
19.06	Identify and apply Copyright Fair Use guidelines.		
19.07	Evaluate online information for credibility and quality using basic guidelines and indicators (e.g. authority, affiliation, purpose, etc.).		
20.0	Demonstrate an understanding of Internet safety and ethics. – The student will be able to:		
20.01	Describe cyber-bullying and its impact on perpetrators and victims.		
20.02	Differentiate between viruses and malware, specifically their sources, ploys, and impact on personal privacy and computer operation, and ways to avoid infection.		
20.03	Demonstrate proficiency running an antivirus scan to remove viruses and malware.		
20.04	Describe risks associated with social networking sites (e.g., FaceBook, MySpace, and Twitter) and ways to mitigate these risks.		
20.05	Adhere to cyber safety practices with regard to conducting Internet searches, email, chat rooms, and other social network websites.		
20.06	Adhere to Acceptable Use Policies when accessing the Internet.		
21.0	Develop and apply word processing and document manipulation skills. – The student will be able to:		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
21.01	Apply and adjust margins, tabs, line spacing and paragraph indents.		
21.02	Insert and manipulate text, graphics/images, and WordArt.		
21.03	Format text using the font interface and styles interface.		
21.04	Adjust the size, position, and layout wrapping settings of a graphic/image.		
21.05	Use the status bar to determine the number of pages, words, and characters in a document.		
21.06	Insert codes for current date and time.		
21.07	Copy text between documents using mouse, menu, and keyboard techniques.		
21.08	Move text in a document using mouse, menu, and keyboard techniques.		
21.09	Create bulleted and numbered lists.		
21.10	Create a table – Inserting, moving and entering data.		
21.11	Create a table – format rows, columns and cells.		
21.12	Insert page breaks.		
21.13	Adjust magnification of document display single and multiple pages.		
21.14	Understand printing options including shrink to fit, gutters, and document orientation.		
21.15	Create a report or essay that contains a title page, text, a graphic/image, and WordArt.		
22.0	Develop and apply fundamental spreadsheet skills. – The student will be able to:		
22.01	Describe a spreadsheet and the ways in which it may be used.		
22.02	Identify the parts of the spreadsheet display.		
22.03	Insert and format text information into cells.		
22.04	Insert and format numeric information into cells.		
22.05	Insert and format date and time information into cells.		
22.06	Select multiple cells using the mouse.		
22.07	Copy information from one or more cells to another part of the spreadsheet.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
22.08	Move information from one or more cells to another part of the spreadsheet.		
22.09	Sum the numeric values of multiple cells.		
22.10	Use the sort function to alphabetize a table of information.		
22.11	Create and navigate through a worksheet.		
22.12	Change column width and row height.		
22.13	Insert columns and rows.		
22.14	Merge cells.		
22.15	Use Undo and Redo features.		
22.16	Insert arithmetic formulas into a spreadsheet.		
22.17	Create and print a table that displays and sums the quantities or values of different categories of data.		
22.18	Create a chart based on data sets defined in a spreadsheet.		
22.19	Adjust chart types to appropriately represent base data.		
22.20	Create formulas using multiple cells and higher level functions which are dependent on other referenced cells (sqrt, avg, stddev, etc)		
22.21	Apply references to cells to be used as variables in multiple locations.		
23.0	Demonstrate safe and appropriate use of tools. – The student will be able to:		
23.01	Select appropriate tools, procedures, and/or equipment.		
23.02	Demonstrate the safe usage of appropriate tools, procedures, and operation of equipment.		
23.03	Follow laboratory safety rules and procedures.		
23.04	Demonstrate good housekeeping at workstation within total laboratory.		
23.05	Identify color-coding safety standards.		
23.06	Explain fire prevention and safety precautions and practices for extinguishing fires.		
23.07	Identify harmful effects/potential dangers of familiar hazardous substances/devices to people and the environment.		

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.

Florida Standards			Correlation to CTE Program Standard #
01.0	Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Applied Engineering Technology.		
	01.01 Key Ideas and Details		
	01.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. LAFS.910.RST.1.1	
	01.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.910.RST.1.2	
	01.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.910.RST.1.3	
	01.02 Craft and Structure		
	01.02.1	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. LAFS.910.RST.2.4	
	01.02.2	Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). LAFS.910.RST.2.5	
	01.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. LAFS.910.RST.2.6	

Florida Standards			Correlation to CTE Program Standard #
	01.03	Integration of Knowledge and Ideas	
	01.03.1	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. LAFS.910.RST.3.7	
	01.03.2	Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. LAFS.910.RST.3.8	
	01.03.3	Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. LAFS.910.RST.3.9	
	01.04	Range of Reading and Level of Text Complexity	
	01.04.1	By the end of grade 9, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	01.04.2	By the end of grade 10, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 9–10 text complexity band independently and proficiently. LAFS.910.RST.4.10	
02.0	Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Applied Engineering Technology.		
	02.01	Text Types and Purposes	
	02.01.1	Write arguments focused on discipline-specific content. LAFS.910.WHST.1.1	
	02.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.910.WHST.1.2	
	02.02	Production and Distribution of Writing	
	02.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.910.WHST.2.4	

Florida Standards			Correlation to CTE Program Standard #
	02.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.910.WHST.2.5	
	02.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. LAFS.910.WHST.2.6	
	02.03	Research to Build and Present Knowledge	
	02.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.910.WHST.3.7	
	02.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. LAFS.910.WHST.3.8	
	02.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.910.WHST.3.9	
	02.04	Range of Writing	
	02.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.910.WHST.4.10	
03.0	Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Applied Engineering Technology.		
	03.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	
	03.02	Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
	03.03	Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	

Florida Standards	Correlation to CTE Program Standard #
03.04 Model with mathematics. MAFS.K12.MP.4.1	
03.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
03.06 Attend to precision. MAFS.K12.MP.6.1	
03.07 Look for and make use of structure. MAFS.K12.MP.7.1	
03.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
24.0 Demonstrate an understanding of the various approaches used in problem solving. – The student will be able to:		
24.01 Employ research and development processes to assess the functional, economic, and ethical viability of a product or prototype.		
24.02 Research a problem and determine the most appropriate problem-solving method to employ.		
24.03 Determine whether the solution to a specific problem is technology-based.		
24.04 Utilize a multidisciplinary approach to solving technological problems.		
25.0 Demonstrate the abilities to apply the design process. – The student will be able to:		
25.01 Determine whether a design problem is worthy of being resolved or addressed.		
25.02 Identify the criteria and constraints associated with a design problem and select the most appropriate solution based on pre-determined factors.		
25.03 Evaluate the quality, efficiency, and productivity of an existing or proposed design and refine the design accordingly.		
25.04 Evaluate an existing design using conceptual, physical, and mathematical models and note aspects for improvement.		
25.05 Devise and develop a problem solution using the design process.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
25.06	Create and deliver a slide presentation to communicate the design process and final solution to a design problem.		
26.0	Demonstrate proficiency in using presentation software. – The student will be able to:		
26.01	Describe presentation software and the ways in which it may be used.		
26.02	Create a Slide Master.		
26.03	Adjust presentation format using the Slide Master.		
26.04	Add and format titles, subtitles, and talking points to a presentation slide.		
26.05	Insert date and time codes and slide numbers to slides.		
26.06	Insert and format images/graphics onto slides.		
26.07	Insert new or duplicate slides.		
26.08	Adjust slide transition to include animation.		
26.09	Insert and adjust sound settings and timing in presentation.		
26.10	Adjust the sequence of slides in the presentation.		
26.11	Produce a presentation that includes text, graphics, and digital images and present it using a projection system.		
26.12	Adjust Slide Show Set-up to loop show continuously.		
27.0	Perform advanced study and technical skills related to engineering technology. – The student will be able to:		
27.01	Identify an engineering problem or product for improvement using engineering design methodology.		
27.02	Develop a written plan of work for the engineering team to carry out the project.		
27.03	Show evidence of technical research in support of the project.		
27.04	Perform skills related to the engineering project.		
27.05	Complete the project as planned.		
27.06	Demonstrate the engineering design solution to a fluid system problem.		
27.07	Demonstrate the engineering design solution to an electrical system problem.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	27.08 Demonstrate the engineering design solution to a thermal system problem.		
	27.09 Demonstrate and present the engineering design solution to a mechanical system problem.		
	27.10 Formulate conclusions based on the analysis of engineered products.		
28.0	Demonstrate fundamental math and science knowledge and skills for mechanical systems. – The student will be able to:		
	28.01 Define and calculate quantities using Hooke's Law of Elasticity.		
	28.02 Assemble, operate, and identify the parts of a mechanical system.		
	28.03 Demonstrate and apply principles of force, work, rate, resistance, energy, power, and force transformers relating to mechanical systems.		
	28.04 Calculate the mechanical advantage of a mechanical system		
	28.05 Design a mechanical system to demonstrate knowledge of mechanical advantage.		
29.0	Demonstrate technical knowledge and skills for fluid systems. – The student will be able to:		
	29.01 Define and calculate quantities using Boyle's Law.		
	29.02 Assemble, operate, and identify the parts of a fluid system.		
	29.03 Demonstrate and apply principles of force, work, rate, resistance, energy, power, and force transformers relating to fluid systems.		
	29.04 Compute the mechanical advantage of a fluid system.		
	29.05 Compute the change in height in the output piston based on change in input piston and relative sizes.		
	29.06 Design a fluid system to demonstrate knowledge of mechanical advantage.		
30.0	Demonstrate technical knowledge and skills for thermal systems. – The student will be able to:		
	30.01 Define and calculate quantities of heat and temperature.		
	30.02 Assemble, operate, and identify the parts of a thermal system.		
	30.03 Demonstrate and apply principles of force, work, rate, resistance, energy, power, and force transformers relating to fluid systems.		
	30.04 Compute the efficiency of a thermal system.		
	30.05 Explain the steps in a PV diagram including the phases where work is done.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
31.0	Demonstrate technical knowledge and skills associated with the design of electrical and electronic systems. – The student will be able to:		
31.01	Assemble, operate, and identify the parts of an electrical system.		
31.02	Demonstrate and apply principles of force, work, rate, resistance, energy, power, and force transformers relating to electrical systems.		
31.03	Understand the connectivity between the major components. Identify Address and data buses, power signals and peripheral devices.		
31.04	Recognize the schematic symbols for basic electronic components (e.g., resistors, capacitors, inductors, transistors, and black box components such as microprocessors).		
31.05	Describe basic logic devices (e.g., AND, NAND, OR, NOR) and their role in the design of electrical/electronic systems.		
31.06	Create and apply the truth tables for the basic logical elements (i.e., AND, NAND, OR, and NOR gates).		
31.07	Identify electrical connections between devices on an electrical schematic.		
31.08	Use Boolean algebra to minimize logic equations and implement them in breadboard devices.		
31.09	Design and create a prototype of a basic electronic system to demonstrate knowledge of DC series and parallel logic circuitry.		
32.0	Demonstrate safe and appropriate use of basic tools and machines. – The student will be able to:		
32.01	Select appropriate tools, procedures, and/or equipment.		
32.02	Demonstrate the safe usage of appropriate tools, procedures, and operation of equipment.		
32.03	Follow laboratory safety rules and procedures.		
32.04	Demonstrate good housekeeping at workstation within total laboratory.		
32.05	Identify color-coding safety standards.		
32.06	Explain fire prevention and safety precautions and practices for extinguishing fires.		
32.07	Identify harmful effects/potential dangers of familiar hazardous substances/devices to people and the environment.		

Florida Department of Education
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 #43 and #44 for <u>one</u> of the engineering disciplines, in addition to the other standards.

Florida Standards			Correlation to CTE Program Standard #
33.0	Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Applied Engineering Technology.		
	33.01 Key Ideas and Details		
	33.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. LAFS.1112.RST.1.1	
	33.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.1112.RST.1.2	
	33.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.1112.RST.1.3	
	33.02 Craft and Structure		
	33.02.1	Determine the meaning of symbols key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. LAFS.1112.RST.2.4	
	33.02.2	Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. LAFS.1112.RST.2.5	

Florida Standards			Correlation to CTE Program Standard #
	33.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. LAFS.1112.RST.2.6	
33.03	Integration of Knowledge and Ideas		
	33.03.1	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g. quantitative data, video, multimedia) in order to address a question or solve a problem. LAFS.1112.RST.3.7	
	33.03.2	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. LAFS.1112.RST.3.8	
	33.03.3	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. LAFS.1112.RST.3.9	
33.04	Range of Reading and Level of Text Complexity		
	33.04.1	By the end of grade 11, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	33.04.2	By the end of grade 12, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 11–CCR text complexity band independently and proficiently. LAFS.1112.RST.4.10	
34.0	Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Applied Engineering Technology.		
34.01	Text Types and Purposes		
	34.01.1	Write arguments focused on discipline-specific content. LAFS.1112.WHST.1.1	
	34.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.1112.WHST.1.2	
34.02	Production and Distribution of Writing		

Florida Standards			Correlation to CTE Program Standard #
	34.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.1112.WHST.2.4	
	34.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.1112.WHST.2.5	
	34.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. LAFS.1112.WHST.2.6	
34.03	Research to Build and Present Knowledge		
	34.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.1112.WHST.3.7	
	34.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. LAFS.1112.WHST.3.8	
	34.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.1112.WHST.3.9	
34.04	Range of Writing		
	34.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.1112.WHST.4.10	
35.0	Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Applied Engineering Technology.		
	35.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	
	35.02	Reason abstractly and quantitatively. MAFS.K12.MP.2.1	

Florida Standards	Correlation to CTE Program Standard #
35.03 Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
35.04 Model with mathematics. MAFS.K12.MP.4.1	
35.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
35.06 Attend to precision. MAFS.K12.MP.6.1	
35.07 Look for and make use of structure. MAFS.K12.MP.7.1	
35.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
36.0	Demonstrate an understanding of the cultural, social, economic, and political effects of technology. – The student will be able to:		
36.01	Discuss changes in cultural, social, economic, and political behavior caused by the use of technology.		
36.02	Describe the consequences of weighing the trade-offs between the positive and negative effects of technology.		
36.03	Discuss the ethical considerations in developing, selecting, and using technology.		
36.04	Debate the cultural, social, economic, and political changes caused by the transfer of a technology from one society to another.		
37.0	Demonstrate an understanding of the effects of technology on the environment. – The student will be able to:		
37.01	Describe the trade-offs of developing technologies to reduce the use of resources.		
37.02	Describe how the alignment of technological and natural processes impacts the environment.		
37.03	Identify technologies developed for the purpose of reducing negative consequences of other technologies.		
37.04	Debate the implementation of technologies having positive and negative effects on the environment.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
38.0	Demonstrate the abilities to assess the impact of products and systems. – The student will be able to:		
38.01	Collect information and evaluate its quality.		
38.02	Synthesize data, analyze trends, and draw conclusions regarding the effect of technology on the individual, society, and the environment.		
38.03	Apply assessment techniques, such as trend analysis and experimentation to make decisions about the future development of technology.		
38.04	Design forecasting techniques to evaluate the results of altering natural systems.		
39.0	Successfully work as a member of a team. – The student will be able to:		
39.01	Accept responsibility for specific tasks in a given situation.		
39.02	Maintain a positive relationship with other team members.		
39.03	Document progress, and provide feedback on work accomplished in a timely manner.		
39.04	Complete assigned tasks in a timely and professional manner.		
39.05	Reassign responsibilities when the need arises.		
39.06	Complete daily tasks as assigned on one's own initiative.		
40.0	Plan, organize, and carry out a project plan. – The student will be able to:		
40.01	Determine the scope of a project.		
40.02	Organize the team according to individual strengths.		
40.03	Assign specific tasks within a team.		
40.04	Determine project priorities.		
40.05	Identify required resources.		
40.06	Record project progress in a process journal.		
40.07	Record and account for budget expenses during the life of the project.		
40.08	Carry out the project plan to successful completion and delivery.		
41.0	Manage resources. – The student will be able to:		
41.01	Identify required resources and associated costs for each stage of the project plan.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	41.02 Create a project budget based on the identified resources.		
	41.03 Determine the methods needed to acquire needed resources.		
	41.04 Demonstrate good judgment in the use of resources.		
	41.05 Recycle and reuse resources where appropriate.		
	41.06 Demonstrate an understanding of proper legal and ethical waste disposal.		
42.0	Use tools, materials, and processes in an appropriate and safe manner. – The student will be able to:		
	42.01 Identify the proper tool for a given job.		
	42.02 Use tools and machines in a safe manner.		
	42.03 Adhere to laboratory safety rules and procedures.		
	42.04 Identify the application of processes appropriate to the task at hand.		
	42.05 Identify materials appropriate to their application.		
Mechanical Engineering Discipline			
43.0	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:		
	43.01 Describe mechanically engineered assemblies used in industrial manufacturing, the technologies they employ, their design criteria, and constraints.		
	43.02 Describe mechanically engineered assemblies used in aviation and aerospace, the technologies they employ, their design criteria, and constraints.		
	43.03 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.		
	43.04 Describe mechanically engineered assemblies used in the medical field, the technologies they employ, their design criteria, and constraints.		
	43.05 Describe mechanically engineered assemblies used in underwater environments, the technologies they employ, their design criteria, and constraints.		
	43.06 Describe mechanically engineered assemblies used in high speed/repetitive manufacturing or processing environments, the technologies they employ, their design criteria, and constraints.		
44.0	Design and build a mechanically engineered solution suitable for a particular application in a defined environment. – The student will be able to:		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
44.01	Design and build a solution to a problem using the principles of mechanical engineering.		
44.02	Incorporate principles of electricity, thermodynamics, hydraulics, and pneumatics, as appropriate, into the design of a mechanically engineered solution.		
44.03	Incorporate at least one advanced feature into the solution's design.		
44.04	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.		
44.05	Present your portfolio to a review committee.		
Electrical Engineering Discipline			
43.0	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:		
43.01	Describe electrical engineering applications used in power distribution and transmission systems, the technologies they employ, their design criteria, and constraints.		
43.02	Describe electrical engineering applications used in control systems (e.g., PLC's, microcontrollers), the technologies they employ, their design criteria, and constraints.		
43.03	Describe electrical engineering applications used in DC and AC electronics, the technologies they employ, their design criteria, and constraints.		
43.04	Describe electrical engineering applications used in signal processing and telecommunications, the technologies they employ, their design criteria, and constraints.		
43.05	Describe electrical engineering applications used in sensors and instrumentation applications, the technologies they employ, their design criteria, and constraints.		
43.06	Describe electrical engineering applications used in consumer electronics and computer applications, the technologies they employ, their design criteria, and constraints.		
44.0	Design and build a mechanically engineered solution suitable for a particular application in a defined environment. – The student will be able to:		
44.01	Design and build a solution to a problem using the principles of electrical engineering.		
44.02	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.		
44.03	Incorporate at least one advanced feature into the solution's design.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
44.04	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.		
44.05	Present your portfolio to a review committee.		
Civil Engineering Discipline			
43.0	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:		
43.01	Describe civil engineered solutions used in coastal area planning, construction and structural design, transportation, GIS and surveying, urban and water resources.		
43.02	Describe civil engineering solutions, the technologies they employ, their design criteria, and constraints.		
43.03	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.		
43.04	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.		
43.05	Describe civil engineering solutions used in designing, constructing, and maintaining transportation infrastructure (e.g. including roadways, railways, airports and mass transit systems, et al.).		
43.06	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.		
43.07	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.		
44.0	Design and build a mechanically engineered solution suitable for a particular application in a defined environment. – The student will be able to:		
44.01	Design and build a solution to a problem using the principles of civil engineering.		
44.02	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.		
44.03	Incorporate at least one advanced feature into the solution’s design.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
44.04	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.		
44.05	Present your portfolio to a review committee.		
Environmental Engineering Discipline			
43.0	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:		
43.01	Describe environmental engineered solutions, the technologies they employ, their design criteria, and constraints.		
43.02	Describe environmental engineered solutions related to water supply and treatment, the technologies they employ, their design criteria, and constraints.		
43.03	Describe environmental engineered solutions related to waste management, the technologies they employ, their design criteria, and constraints.		
43.04	Describe environmental engineered solutions related to air and water pollution, the technologies they employ, their design criteria, and constraints.		
43.05	Describe environmental engineered solutions related to coastal and intercoastal environments, the technologies they employ, their design criteria, and constraints.		
43.06	Describe environmental engineered solutions related to agricultural environments, the technologies they employ, their design criteria, and constraints.		
43.07	Describe environmental engineered solutions related to industrial environments, the technologies they employ, their design criteria, and constraints.		
44.0	Design and build an environmental engineered solution suitable for a particular application in a defined environment. – The student will be able to:		
44.01	Design and build a solution to a problem using the principles of environmental engineering.		
44.02	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.		
44.03	Incorporate at least one advanced feature into the solution’s design.		
44.04	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.		
44.05	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.

Career and Technical Student Organization (CTSO)

The Florida Technology Student Association (FL-TSA) is the intercurricular career and technical student organization for providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

Cooperative Training – OJT

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

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 Occupational Completion Point (OCP) or a Modified Occupational Completion Point (MOCP). If needed, a student may enroll in the same career and technical course more than once. Documentation should be included in the IEP that clearly indicates that it is anticipated that the student may need an additional year to complete an OCP/MOCP. The student should work on different competencies and new applications of competencies each year toward completion of the OCP/MOCP. After achieving the competencies identified for the year, the student earns credit for the course. It is important to ensure that credits earned by students are reported accurately. The district's information system must be designed to accept multiple credits for the same course number for eligible students with disabilities.

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

Florida Department of Education
Curriculum Framework

Program Title: **Maritime Technology**
Program Type: **Non Career Preparatory**
Career Cluster: **Engineering & Technology Education**

Secondary – Non Career Preparatory	
Program Number	8404100
CIP Number	0649039903
Grade Level	9 – 12, 30, 31
Standard Length	4 credits
Teacher Certification	TECH ED 1 @2 SEAMANSHIP 7G
CTSO	Florida Technology Student Association (FL-TSA)
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 provide coherent and rigorous content aligned with challenging academic standards, relevant technical knowledge, and skills needed to prepare students for postsecondary education and careers in the Engineering and Technology Education career cluster. This sequence provides technical skill proficiency that 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, occupation-specific skills, and knowledge of all aspects of the Engineering and Technology Education career cluster.

The content includes but is not limited to broad transferable skills that stress understanding and demonstration of the following elements of the maritime industry; planning, management, finance, technical and product skills, underlying principles of technology, labor issues, community issues and health, safety, and environmental issues.

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

Program Structure

This program is a planned sequence of instruction consisting of four one-credit courses. The following table illustrates the program structure:

Course Number	Course Title	Length	Level	Graduation Requirement
8404110	Maritime 1	1 credit	2	VO
8404120	Maritime 2	1 credit	2	VO
8404130	Maritime 3	1 credit	2	VO
8404140	Maritime 4	1 credit	2	VO

(Graduation Requirement Abbreviations- EQ= Equally Rigorous Science, PA= Practical Arts, EC= Economics, VO= Career and Technical Education)

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.

Academic Alignment Table

Academic alignment is an ongoing, collaborative effort of professional educators specializing in the fields of science, mathematics, English/language arts, and Career and Technical Education (CTE). This initiative supports CTE programs by improving student performance through the integration of academic content within CTE courses. Career and Technical Education courses that have been aligned to the Next Generation Sunshine State Standards for Science and the Florida Standards for Mathematics and English/Language Arts will show the following data: the quantity of academic standards in the CTE course; the total number of standards contained in the academic course; and the percentage of alignment to the CTE course.

Courses	Anatomy/ Physiology Honors	Astronomy Solar/Galactic Honors	Biology 1	Chemistry 1	Earth-Space Science	Environmental Science	Genetics	Integrated Science	Marine Science 1 Honors	Physical Science	Physics 1
8404110	**	**	**	**	**	**	**	**	**	**	**
8404120	**	**	**	**	**	**	**	**	**	**	**
8404130	**	**	**	**	**	**	**	**	**	**	**
8404140	**	**	**	**	**	**	**	**	**	**	**

** *Alignment pending review* # *Alignment attempted, but no correlation to academic course*

Courses	Algebra 1	Algebra 2	Geometry	English 1	English 2	English 3	English 4
8404110	**	**	**	**	**	**	**
8404120	**	**	**	**	**	**	**
8404130	**	**	**	**	**	**	**

Courses	Algebra 1	Algebra 2	Geometry	English 1	English 2	English 3	English 4
8404140	**	**	**	**	**	**	**

** *Alignment pending review* # *Alignment attempted, but no correlation to academic course*

Florida Standards for Technical Subjects

Florida Standards (FS) for English Language Arts and Literacy in History/Social Studies, Science, and Technical Subjects are the critical reading and writing literacy standards designed for grade 6 and above. These standards are predicated on teachers of history/social studies, science, and technical subjects using their content area expertise to help students meet the particular challenges of reading, writing, speaking, listening, and language in their respective fields. It is important to note that the 6-12 literacy standards in history/social studies, science, and technical subjects are not meant to replace content standards in those areas but rather to supplement them.

This curriculum framework incorporates the grades 9-10 reading and writing literacy standards in the first two courses of this CTE program and grade 11-12 reading and writing literacy standards in the third and fourth courses of this CTE program. The standards for Mathematical Practices describe varieties of expertise that educators at all levels should seek to develop in their students. These practices rest on important "processes and proficiencies" with longstanding importance in mathematics education. This curriculum framework incorporates the appropriate mathematical practices in the first four courses of this CTE program.

Common Career Technical Core – Career Ready Practices

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

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

2. Apply appropriate academic and technical skills.

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

4. Communicate clearly, effectively and with reason.

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

6. Demonstrate creativity and innovation.

7. Employ valid and reliable research strategies.

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

9. Model integrity, ethical leadership and effective management.

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

11. Use technology to enhance productivity.

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

Standards

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

01.0 Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Maritime Technology.
02.0 Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Maritime Technology.
03.0 Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Maritime Technology.
04.0 Demonstrate knowledge relating to the historical origins of the maritime industry as it relates to vessel development, culture, and trade.
05.0 Demonstrate proficiency in understanding the various career paths in the maritime industry.
06.0 Demonstrate an understanding of required skills sets by mariners, including safety training, regulations, and leadership.
07.0 Demonstrate proficiency in using engineering methods for ship construction and design.
08.0 Demonstrate an understanding of common navigation systems used in the maritime industry.
09.0 Identify and explain various vessels and their and their use.
10.0 Evaluate the environmental impact of the maritime industry.
11.0 Demonstrated an understanding of the business of maritime as related to shipping operations.
12.0 Demonstrate an understanding of the business of shipping as related to port operations.
13.0 Demonstrate an understanding of various cargo and cargo management systems.
14.0 Demonstrate an understanding of international trade and its impact on the world economy.
15.0 Examine the legal aspects of the maritime industry.
16.0 Explain the importance of vessel and ship security.
17.0 Examine the potential and use of marine resources.
18.0 Demonstrate an understanding of oceanography concepts.
19.0 Demonstrate an understanding of the fundamentals of marine biology.
20.0 Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Maritime Technology.
21.0 Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Maritime Technology.
22.0 Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Maritime Technology.

Florida Department of Education
Student Performance Standards

Course Title: **Maritime 1**
Course Number: **8404110**
Course Credit: **1**

Course Description:
This course provides students with an understanding of the field of maritime studies and prepares for postsecondary programs, as well as the world of work, by developing an in-depth mastery of maritime industry related concepts and their relationship to the business of shipping. The course also includes various concepts of history, science, technology, engineering, and mathematics, as well as social and political implications of the maritime industry on the international scale.

Florida Standards			Correlation to CTE Program Standard #
01.0	Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Maritime Technology.		
	01.01 Key Ideas and Details		
	01.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. LAFS.910.RST.1.1	
	01.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.910.RST.1.2	
	01.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.910.RST.1.3	
	01.02 Craft and Structure		
	01.02.1	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. LAFS.910.RST.2.4	
	01.02.2	Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). LAFS.910.RST.2.5	

Florida Standards			Correlation to CTE Program Standard #
	01.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. LAFS.910.RST.2.6	
01.03	Integration of Knowledge and Ideas		
	01.03.1	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. LAFS.910.RST.3.7	
	01.03.2	Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. LAFS.910.RST.3.8	
	01.03.3	Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. LAFS.910.RST.3.9	
01.04	Range of Reading and Level of Text Complexity		
	01.04.1	By the end of grade 9, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	01.04.2	By the end of grade 10, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 9–10 text complexity band independently and proficiently. LAFS.910.RST.4.10	
02.0	Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Maritime Technology.		
02.01	Text Types and Purposes		
	02.01.1	Write arguments focused on discipline-specific content. LAFS.910.WHST.1.1	
	02.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.910.WHST.1.2	
02.02	Production and Distribution of Writing		

Florida Standards			Correlation to CTE Program Standard #
	02.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.910.WHST.2.4	
	02.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.910.WHST.2.5	
	02.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. LAFS.910.WHST.2.6	
	02.03	Research to Build and Present Knowledge	
	02.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.910.WHST.3.7	
	02.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. LAFS.910.WHST.3.8	
	02.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.910.WHST.3.9	
	02.04	Range of Writing	
	02.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.910.WHST.4.10	
03.0	Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Maritime Technology.		
	03.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	
	03.02	Reason abstractly and quantitatively. MAFS.K12.MP.2.1	

Florida Standards	Correlation to CTE Program Standard #
03.03 Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
03.04 Model with mathematics. MAFS.K12.MP.4.1	
03.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
03.06 Attend to precision. MAFS.K12.MP.6.1	
03.07 Look for and make use of structure. MAFS.K12.MP.7.1	
03.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
04.0	Demonstrate knowledge relating to the historical origins of the maritime industry from vessel development, cultural, and trade perspectives--The student will be able to:		
04.01	Identify different types of ships and their origins.		
04.02	Construct a three-dimensional model of a historical ship.		
04.03	Create a timeline showing significant milestones in maritime history.		
04.04	Describe the significance of the Phoenicians, Vikings, and Asians on maritime cultures and traditions.		
04.05	Identify changes in sea going trade over the centuries.		
04.06	Describe the effect of trade on colonialism and the developing world.		
05.0	Demonstrate proficiency in understanding the various career paths in the maritime industry--The student will be able to:		
05.01	Identify important factors to choosing a career.		
05.02	Explain the importance of planning for a career.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
05.03	Evaluate the impact of education on long term career success.		
05.04	Describe the many career paths in the maritime industry.		
05.05	Describe the skills and personal qualities needed for maritime careers.		
05.06	Describe the everyday life of people working in maritime careers.		
05.07	Describe the future growth trends of maritime careers.		
05.08	Create a personal maritime career path based on interest.		
05.09	Describe careers in the shipyard.		
05.10	Explain the skills and education needed to work in various shipyard careers.		
05.11	Describe careers located in ports.		
05.12	Explain the skills and education needed to work in various port careers.		
05.13	Describe careers working on at sea.		
05.14	Explain the skills and education needed to work in various careers at sea.		
06.0	Demonstrate an understanding of required skills sets by mariners including, safety training, regulations, and leadership--The student will be able to:		
06.01	Create a timeline explaining the evolution of the U.S. Coast Guard.		
06.02	Explain the main functions of the U.S. Coast Guard.		
06.03	Describe the U.S. Coast Guard and its place in the U.S. military.		
06.04	Describe the organization and leadership hierarchy on a vessel.		
06.05	Explain Master's Level of Authority.		
06.06	Describe the importance of leadership and chain-of-command on a vessel.		
06.07	Use seamanship skills to tie knots, handle lines, identify equipment, and practice safe work methods.		
06.08	Describe the process of watch keeping, navigation, boat handling, anchoring, and mooring.		
06.09	Use seamanship terminology.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
07.0	Demonstrate proficiency in using engineering methods for ship construction and design--The student will be able to:		
07.01	Identify and describe two types of marine engines.		
07.02	Explain the phenomenon of wind generation.		
07.03	Explain how wind has been used to propel ships.		
07.04	Describe the process and instrumentation for measuring and calculating wind power.		
07.05	Describe the principles of buoyancy.		
07.06	Explain the relationship between weight, volume, and density.		
07.07	Explain Archimedes Principal.		
07.08	Explain how a ship made of steel is able to float.		
07.09	Construct a model vessel from material with a density greater than 1 and ensure it floats.		
07.10	Use the engineering process to create solutions for a maritime related problem.		
07.11	Work in teams to using the engineering process to create solutions for a maritime problem.		
08.0	Demonstrate an understanding of common navigation systems used in the maritime industry--The student will be able to:		
08.01	Describe the purpose and history of charts.		
08.02	Describe the various features of charts.		
08.03	Describe the history of navigation instruments and how they evolved over time.		
08.04	Describe four common navigation instruments used in modern times.		
08.05	Describe the purpose of a sextant.		
08.06	Simulate the use of modern navigation equipment as it would be used in a voyage.		
08.07	Explain the navigational strategy of dead reckoning and when it is appropriate.		
08.08	Plot a course using various chart tools.		
09.0	Identify and explain various vessels and their and their use--The student will be able to:		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	09.01 Identify various types of ships.		
	09.02 Explain specific reasons for different types of ships.		
	09.03 Describe different types of cargo vessels and cargo types.		
	09.04 Describe different types of passenger vessels and their purpose		
10.0	Evaluate the environmental impact of the maritime industry--The student will be able to:		
	10.01 Explain the role of maritime in protection of the environment.		
	10.02 Describe the environmental regulations on the maritime industry.		
11.0	Demonstrated an understanding of the business of maritime as related to shipping operations--The student will be able to:		
	11.01 Explain the process of booking cargo.		
	11.02 Describe crewing requirements for sailing at sea.		
	11.03 Describe the Stevedore process.		
	11.04 Chart a sample ship voyage with stops at multiple ports.		
	11.05 Define and explain Tidal Datum.		
	11.06 Describe the role of tides in worldwide shipping		
	11.07 Explain the process of chartering.		
	11.08 Identify the different types of charters.		
	11.09 Describe the most commonly used clauses in voyage or time chartering.		
	11.10 Describe the business model of ship owners, operators, brokers, and charters.		
12.0	Demonstrate an understanding of the business of shipping as related to port operations--The student will be able to:		
	12.01 Describe the main functions of a port.		
	12.02 Explain the importance of infrastructure networks to ports.		
	12.03 Describe the importance of pipelines to ports.		
	12.04 Evaluate specific ports on their design and transport connections.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
13.0	Demonstrate an understanding of various cargo and cargo management systems--The student will be able to:		
13.01	Provide examples of liquid bulk cargo.		
13.02	Provide examples of bulk cargo.		
13.03	Explain the history on containerization.		
14.0	Demonstrate an understanding of international trade and its impact on the world economy--The student will be able to:		
14.01	Identify worldwide main shipping routes.		
14.02	Identify main commodities that move through international shipping routes.		
14.03	Explain how local resources impact the types of ports, vessels, terminals, and infrastructure in various countries and regions along the main shipping routes.		
14.04	Define tariffs and explain their importance.		
14.05	Explain the operation of the intermodal transportation system.		
14.06	Explain the importance of canal systems on shipping routes.		
14.07	Explain the difference between fronthaul and backhaul cargo.		
15.0	Examine the legal aspects of the maritime industry--The student will be able to:		
15.01	Explain the admiralty law specialization as related to legal application.		
15.02	Describe the legal concept of admiralty jurisdiction.		
15.03	Describe the purpose and operation of limitation of liability.		
16.0	Explain the importance of vessel and ship security--The student will be able to:		
16.01	Describe the function of the U.S. Coast Guard.		
16.02	Explain the position of the U.S. Coast Guard within the U.S. military system.		
16.03	Explain the regulatory operations of U.S. flag ships by the U.S. Coast Guard.		
16.04	Explain how the U.S. Coast Guard protects U.S. coasts.		
16.05	Explain port state control and how it is administered around the world.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
17.0	Examine the potential and use of marine resources--The student will be able to:		
17.01	Identify various energy sources related to the marine environment.		
17.02	Explain how power could be harvested from offshore winds and identify locations for such opportunity around the world.		
17.03	Describe the operations and advantages of coastal wind farms.		
17.04	Provide examples of wind farms currently in operation.		
17.05	Describe how solar energy can be used to provide power for ships.		
17.06	Provide three examples of solar power use in the maritime industry.		
17.07	Explain how power could be generated from currents.		
17.08	Explain the concept of wave energy.		
17.09	Describe how energy can be created from tidal movements and what technology is used to perform this function.		
17.10	Identify areas of the ocean where thermal energy can be found.		
18.0	Demonstrate an understanding of oceanography concepts--The student will be able to:		
18.01	Explain oceanography's role as a marine science disciple and its areas of investigation.		
18.02	Explain how ocean currents form and their role in distribution of heat.		
18.03	Explain the causes of tides.		
18.04	Describe the various types of tides and why they are monitored throughout the maritime industry.		
18.05	Evaluate the difference between tides, currents, and waves.		
18.06	Compare the El Nino and la Nina events and their impact on weather.		
18.07	Identify various ways wave energy is created and how it moves through the ocean.		
18.08	Identify areas under the ocean where plate tectonic activity is occurring.		
18.09	Identify seafloor topographic features.		
18.10	Apply mathematics to waves to solve for wave height and wave length.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	18.11 Explain the Coriolis Effect.		
	18.12 Describe the theory of global warming and how humans have contributed to associated maritime events.		
	18.13 Describe how humans have impacted the world's oceans and steps used to limit these impacts.		
19.0	Demonstrate an understanding of the fundamentals of marine biology--The student will be able to:		
	19.01 Describe how freshwater collects on the earth's surface and its relation to the oceans.		
	19.02 Explain underground water movements and their connection with the oceans.		
	19.03 Compare the chemical composition of freshwater, brackish water, and salt water.		
	19.04 Identify the seasonal beach profiles and organisms that accompany each season.		
	19.05 Identify the various types of currents that interact with the water and land at the beach.		
	19.06 Explain the ecological importance of mangroves in water filtration and runoff.		
	19.07 Describe the organisms that live in mangroves and adapt to tidal fluctuations.		
	19.08 Explain the role of mangroves in high energy events and environmental concerns for their removal.		
	19.09 Identify and explain the importance of estuaries.		
	19.10 Explain the importance of sea grass beds and their importance in raising juvenile organisms.		
	19.11 Describe various water quality parameters that are associated with sea grass productivity.		

Florida Department of Education
Student Performance Standards

Course Title: **Maritime 2**
Course Number: **8404120**
Course Credit: **1**

Course Description:
This course provides students with opportunities to further their mastery on maritime related concepts in preparation for postsecondary education and the world of work. The course builds on material presented in Maritime 1 by increasing the depth and breadth of student knowledge.

Florida Standards			Correlation to CTE Program Standard #
01.0	Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Maritime Technology.		
	01.01 Key Ideas and Details		
	01.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. LAFS.910.RST.1.1	
	01.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.910.RST.1.2	
	01.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.910.RST.1.3	
	01.02 Craft and Structure		
	01.02.1	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. LAFS.910.RST.2.4	
	01.02.2	Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). LAFS.910.RST.2.5	
	01.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. LAFS.910.RST.2.6	

Florida Standards			Correlation to CTE Program Standard #
	01.03	Integration of Knowledge and Ideas	
	01.03.1	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. LAFS.910.RST.3.7	
	01.03.2	Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. LAFS.910.RST.3.8	
	01.03.3	Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. LAFS.910.RST.3.9	
	01.04	Range of Reading and Level of Text Complexity	
	01.04.1	By the end of grade 9, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	01.04.2	By the end of grade 10, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 9–10 text complexity band independently and proficiently. LAFS.910.RST.4.10	
02.0	Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Maritime Technology.		
	02.01	Text Types and Purposes	
	02.01.1	Write arguments focused on discipline-specific content. LAFS.910.WHST.1.1	
	02.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.910.WHST.1.2	
	02.02	Production and Distribution of Writing	
	02.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.910.WHST.2.4	

Florida Standards			Correlation to CTE Program Standard #
	02.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.910.WHST.2.5	
	02.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. LAFS.910.WHST.2.6	
	02.03	Research to Build and Present Knowledge	
	02.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.910.WHST.3.7	
	02.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. LAFS.910.WHST.3.8	
	02.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.910.WHST.3.9	
	02.04	Range of Writing	
	02.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.910.WHST.4.10	
03.0	Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Maritime Technology.		
	03.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	
	03.02	Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
	03.03	Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	

Florida Standards	Correlation to CTE Program Standard #
03.04 Model with mathematics. MAFS.K12.MP.4.1	
03.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
03.06 Attend to precision. MAFS.K12.MP.6.1	
03.07 Look for and make use of structure. MAFS.K12.MP.7.1	
03.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
04.0 Demonstrate knowledge relating to the historical origins of the maritime industry from vessel development, cultural, and trade perspectives--The student will be able to:		
04.07 Describe the impact of shipping on world demographics		
04.08 Describe the Greek and Roman impact on sailing culture.		
04.09 Describe important naval conflicts through the ages.		
04.10 Describe the modern seagoing life.		
04.11 Explain the role of trade on ancient empire development.		
04.12 Explain the role of the spice trade in world economic development.		
04.13 Explain the tea trade and its impact on world history.		
05.0 Demonstrate proficiency in understanding the various career paths in the maritime industry--The student will be able to:		
05.15 Explain the difference between charter boat and commercial boat fishing operations.		
05.16 Describe the duties of a charter boat captain and mate.		
05.17 Describe the duties of a commercial fishing vessel captain and mate.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	05.18 Explain the licensing requirements for a charter vessel captain.		
	05.19 Explain the licensing requirements for a commercial fishing captain.		
06.0	Demonstrate understanding of required skills sets by mariners including, safety training, regulations, and leadership--The student will be able to:		
	06.10 Explain the role of communications technology to the maritime industry.		
	06.11 List the electronic systems used aboard modern vessels.		
	06.12 Identify modern ship to shore communication systems.		
	06.13 Describe modern vessel tracking systems.		
	06.14 Describe the most common short range communications system found on modern vessels.		
	06.15 Describe the most common long rage communications systems found on modern vessels		
	06.16 Explain the use of emergency communications systems such as SSAS, EPIRB, and flares.		
	06.17 Explain the process for sending and emergency distress signal.		
	06.18 Describe common first aid practices and equipment.		
	06.19 Explain the process for acquiring U.S. Coast Guard certification.		
	06.20 Explain the roles of the IMO, USCG, Ports State Control and Class societies in regulating safety management systems.		
	06.21 Explain the requirements for STCW, TOAR, Radar, Firefighting, and PIC licensing.		
	06.22 Describe the need and restrictions of different types of licenses.		
	06.23 Describe the types of service a mariner can perform based on held license.		
07.0	Demonstrate proficiency in using engineering methods for ship construction and design--The student will be able to:		
	07.12 Identify and use two common measurement systems.		
	07.13 Identify units in linear, square, and cubic measurements.		
	07.14 List and describe Newton's Laws of Motion.		
	07.15 List materials commonly used in ship construction.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
07.16	Describe properties of ship construction materials.		
07.17	Identify parameters relevant to ship design.		
07.18	Develop a set of parameters for a ship design.		
07.19	Use the engineering method to solve problems.		
07.20	Identify an engineering problem relevant to maritime studies.		
07.21	Identify software used in ship design.		
07.22	Describe the ship design process.		
08.0	Demonstrate understanding of common navigation systems used in the maritime industry--The student will be able to:		
08.09	Explain the marine rules of the road, their origin, and responsible entity.		
08.10	Use maritime whistle signals to transmit messages.		
08.11	Identify night conditions by following vessel light configurations.		
08.12	Explain the procedure for passing another vessel.		
08.13	Explain how to overtake a vessel when navigating a river.		
08.14	Explain early communication processes using flags and lights.		
08.15	Describe the contributions made by Samuel Morse.		
08.16	Explain worldwide ship communication abilities and how they are used.		
08.17	Explain the modern use of flags aboard merchant vessels.		
08.18	Explain the need for AIS and LRIT systems on modern ships.		
08.19	Create an electronic communications timeline.		
08.20	Compare the use of e-nav and cel-nav.		
08.21	Describe the function, history, and current use of LORAN.		
08.22	Describe the history and function of RADAR.		
08.23	Plot CPA on a RADAR output.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
08.24 Explain the history and function of GPS.		
08.25 Explain the history and function of the depth finder.		
08.26 Explain the history and function of the RDF.		
08.27 Describe the operation of the ECDIS.		
08.28 Explain the various navigation systems as used for ship security.		
09.0 Identify and explain various vessels and their and their use--The student will be able to:		
09.05 Explain why there is a need for different types of ships.		
09.06 Identify different types of ships based on their roles.		
09.07 Provide examples of takers, dry bulk, container, and break bulk vessels.		
09.08 Describe the need for a class of industrial vessels.		
09.09 Explain five industrial vessels and explain the function of each.		
09.10 Explain the principle of buoyancy.		
09.11 Explain the principle of displacement.		
09.12 Describe the concept of density.		
09.13 Describe the relationship between density, displacement, and volume.		
09.14 Explain Archimedes' Principle.		
09.15 Calculate the displacement of a vessel.		
10.0 Evaluate the environmental impact of the maritime industry--The student will be able to:		
10.03 Explain the impact of the maritime industry on air pollution.		
10.04 Describe the process for control of invasive species as related to shipping.		
10.05 Evaluate current invasive species problems and formulate solutions.		
10.06 Describe the occurrence of habitat loss due to the maritime industry needs.		
10.07 Evaluate the impact of algae blooms on the maritime industry.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
11.0	Demonstrated an understanding of the business of maritime as related to shipping operations--The student will be able to:		
11.11	Describe the process of pricing and tariffs.		
11.12	Explain the process of booking cargo on an ocean liner.		
11.13	Explain the purpose of the letter of credit and its impact on shipping operations.		
11.14	Explain the purpose of the bill of lading in a shipping transaction.		
11.15	Describe the complete process of customer inquiry for a request to use a carrier, through goods delivery at destination.		
12.0	Demonstrate an understanding of the business of shipping as related to port operations--The student will be able to:		
12.05	Describe the main characteristics of the different types of terminals.		
12.06	Compare private and public terminals.		
12.07	Explain the need for terminal tariffs.		
12.08	Describe the scheduling process for loading and unloading cargo at terminals.		
12.09	Explain the operations of the stevedores and husbandry.		
12.10	Evaluate the layouts of the three main terminal designs.		
12.11	List all services terminal operators provide.		
12.12	Explain the operation of a Foreign Trade Zone.		
12.13	Describe the different types of marine surveys.		
12.14	Explain the reasons for performing a cargo survey.		
12.15	Explain the reasons for performing a vessel damage survey.		
12.16	Describe a draft survey.		
12.17	Explain the reasons for performing a deadweight survey.		
12.18	Explain the reasons for performing an incline survey.		
12.19	Explain an allusion and how marine surveys play a role in its investigation.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	12.20 Provide examples of situations where multiple surveyors are needed for the same event.		
13.0	Demonstrate an understanding of various cargo and cargo management systems--The student will be able to:		
	13.04 Explain different types of liquid bulk cargo.		
	13.05 Explain the process of measuring standard liquid bulk cargo.		
	13.06 Identify liquid bulk carriers and explain their special characteristics.		
	13.07 Identify liquid bulk trade routes and major global ports.		
	13.08 Explain different types of dry bulk cargo.		
	13.09 Explain the process of measuring dry bulk cargo.		
	13.10 Describe the characteristic of dry bulk carriers.		
	13.11 Identify dry bulk trade routes and major global ports.		
14.0	Demonstrate an understanding of international trade and its impact on the world economy--The student will be able to:		
	14.08 Compare the practices of tramp shipping, liner shipping, and contracted shipping.		
	14.09 Describe the interaction of brokers with cargo interests and tramp vessel owners.		
	14.10 Explain the role of service contract in liner shipping.		
	14.11 Describe NVOCCs and their role in liner shipping.		
	14.12 Explain vessel sharing agreements, slot charter agreements, space agreements, and consortia.		
	14.13 Explain freight rates and their impact on markets as used in liner and tramp shipping.		
	14.14 Examine liner shipping and its importance to the container trade.		
	14.15 Describe the interaction between government policy and freight trading routes.		
15.0	Examine the legal aspects of the maritime industry--The student will be able to:		
	15.04 Explain when admiralty law applies to cases.		
	15.05 Explain the concept of a Charter Party.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
15.06	Describe the function of the time charter.		
15.07	Describe the function of the bareboat charter.		
16.0	Explain the importance of vessel and ship security--The student will be able to:		
16.06	Describe the Maritime Transportation Security Act (MTSA).		
16.07	Describe the roles of the U.S. Coast Guard and the Border Patrol in preventing terrorist acts on U.S. soil.		
16.08	Explain the methods used by U.S agencies to prevent terrorist attacks.		
16.09	Explain the purpose of the Transportation Worker's Identification Credential (TWIC).		
17.0	Examine the potential and use of marine resources--The student will be able to:		
17.11	Identify biological resources found in the ocean and explain how society benefits from their use.		
17.12	Identify various types of energy that can be harvested at the surface of the ocean and at depth.		
17.13	Explain the impact aquaculture has on world populations.		
17.14	Describe the potential harm that is associated with aquaculture practices.		
17.15	Describe the process of desalination and molecular activity that occurs during this process.		
17.16	Compare and contrast the chemical properties of fresh and salt water.		
17.17	Identify substances, such as medications and drugs that have been found in the marine environment.		
18.0	Demonstrate an understanding of oceanography concepts--The student will be able to:		
18.13	Explain the role of chemical oceanography as a marine science.		
18.14	Explain the importance for water through research of its properties.		
18.15	Conduct an experiment to yield freshwater from a saltwater solution.		
18.16	Explain the molecular structure of fresh and salt water.		
18.17	Measure salinity of water using various methods.		
18.18	Research salinity levels of the world's oceans and identify areas with higher than average salt concentrations.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
18.19	Investigate reasons for higher than average slat concentrations in various seas and oceans.		
18.20	Investigate the interaction of fresh and salt water in estuary systems.		
18.21	Explain the study of toxicology as it relates to the marine environment.		
18.22	Explain the process of ocean acidification.		
19.0	Demonstrate an understanding of the fundamentals of marine biology--The student will be able to:		
19.12	Investigate organisms that live in coral reef systems.		
19.13	Identify the ecological importance of carol reef systems.		
19.14	Identify ocean zones from the surface to the deep and the organisms found in each zone.		
19.15	Describe how water moves in the ocean.		
19.16	Identify the causes of algae blooms and their ecological impact on ocean organisms and humans.		
19.17	Identify various types of West Caribbean algae.		
19.18	Describe the structure and function of algae.		

Florida Department of Education
Student Performance Standards

Course Title: **Maritime 3**
Course Number: **8404130**
Course Credit: **1**

Course Description:
This course provides students with opportunities to further their mastery on maritime related concepts in preparation for postsecondary education and the world of work. The course builds on material presented in Maritime 2 by increasing the depth and breadth of student knowledge.

Florida Standards			Correlation to CTE Program Standard #
20.0	Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Maritime Technology.		
	20.01 Key Ideas and Details		
	20.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. LAFS.1112.RST.1.1	
	20.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.1112.RST.1.2	
	20.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.1112.RST.1.3	
	20.02 Craft and Structure		
	20.02.1	Determine the meaning of symbols key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. LAFS.1112.RST.2.4	
	20.02.2	Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. LAFS.1112.RST.2.5	
	20.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. LAFS.1112.RST.2.6	

Florida Standards			Correlation to CTE Program Standard #
	20.03	Integration of Knowledge and Ideas	
	20.03.1	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g. quantitative data, video, multimedia) in order to address a question or solve a problem. LAFS.1112.RST.3.7	
	20.03.2	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. LAFS.1112.RST.3.8	
	20.03.3	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. LAFS.1112.RST.3.9	
	20.04	Range of Reading and Level of Text Complexity	
	20.04.1	By the end of grade 11, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	20.04.2	By the end of grade 12, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 11–CCR text complexity band independently and proficiently. LAFS.1112.RST.4.10	
21.0	Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Maritime Technology.		
	21.01	Text Types and Purposes	
	21.01.1	Write arguments focused on discipline-specific content. LAFS.1112.WHST.1.1	
	21.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.1112.WHST.1.2	
	21.02	Production and Distribution of Writing	
	21.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.1112.WHST.2.4	

Florida Standards			Correlation to CTE Program Standard #
	21.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.1112.WHST.2.5	
	21.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. LAFS.1112.WHST.2.6	
	21.03	Research to Build and Present Knowledge	
	21.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.1112.WHST.3.7	
	21.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. LAFS.1112.WHST.3.8	
	21.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.1112.WHST.3.9	
	21.04	Range of Writing	
	21.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.1112.WHST.4.10	
22.0	Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Maritime Technology.		
	22.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	
	22.02	Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
	22.03	Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	

Florida Standards	Correlation to CTE Program Standard #
22.04 Model with mathematics. MAFS.K12.MP.4.1	
22.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
22.06 Attend to precision. MAFS.K12.MP.6.1	
22.07 Look for and make use of structure. MAFS.K12.MP.7.1	
22.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
04.0 Demonstrate knowledge relating to the historical origins of the maritime industry from vessel development, cultural, and trade perspectives--The student will be able to:		
04.14 Describe the evolution of ship steering systems.		
04.15 Provide a historical analysis of piracy through the ages.		
04.16 Explain the change from break bulk cargo shipping to containerization.		
04.17 Describe the effect of communications technology on trade through the ages.		
05.0 Demonstrate proficiency in understanding the various career paths in the maritime industry--The student will be able to:		
05.20 Explain the specialized training required for a career in admiralty law.		
05.21 Compare careers in naval architecture, design engineering, and operating engineering.		
05.22 Describe the main responsibilities of a chief engineer.		
05.23 Explain the process for achieving a position of chief engineer.		
05.24 Describe the main responsibilities of a design engineer.		
05.25 Explain the licensing requirements to attaining a position of a practicing engineer.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	05.26 List the careers associated with the offshore drilling industry.		
	05.27 Describe the main responsibilities of a tool pusher.		
	05.28 Describe the main responsibilities of a rig boss.		
	05.29 Describe the main responsibilities of a roustabout.		
06.0	Demonstrate an understanding of required skills sets by mariners including, safety training, regulations, and leadership--The student will be able to:		
	06.24 Explain the reasons for proper knot tying and line handling.		
	06.25 Demonstrate splicing techniques.		
	06.26 Explain the use of a stopper.		
	06.27 Evaluate various materials used to construct mooring lines.		
	06.28 Explain the purpose and functionality of risk assessment as related to shipping.		
	06.29 Participate in personal risk assessment activities.		
	06.30 Participate in group risk assessment activities.		
	06.31 Explain the process of documentation and evaluation of non-conformance.		
07.0	Demonstrate proficiency in using engineering methods for ship construction and design--The student will be able to:		
	07.23 Describe the use of model for ship hull design.		
	07.24 Explain the use of half breadth models.		
	07.25 Describe model basin method of proving hull designs.		
	07.26 Report on an active model basin facility.		
	07.27 Describe how shipbuilding methods have evolved over the centuries.		
	07.28 Explain the Laid Keel method of shipbuilding.		
	07.29 Explain the modular method of shipbuilding.		
	07.30 Research the construction of a present day vessel.		
	07.31 Explain the function of the screw as an invention and simple machine.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	07.32 Describe the transition from paddle wheels to propellers.		
	07.33 Explain the effects of the pitch of a propeller.		
	07.34 Explain the two modes of propeller action.		
	07.35 Describe the concept of the Bollard Pull, its calculation and measurement techniques.		
	07.36 Explain the characteristics of the three types of rudders.		
	07.37 Describe modern methods of attaching and controlling rudders.		
	07.38 Describe modern methods of steering that do not use rudders.		
	07.39 Explain the Willy Beck rudder design.		
	07.40 Research the development of side thrusters in use on modern vessels.		
08.0	Demonstrate an understanding of common navigation systems used in the maritime industry--The student will be able to:		
	08.29 Explain the importance of tides to ship navigation systems.		
	08.30 Explain the importance of currents to ship navigation.		
	08.31 Describe effect currents have on ships in open waters.		
	08.32 Describe the effect currents have on ships in restricted waters.		
	08.33 Evaluate the effect of currents and tides on dead reckoning navigation.		
	08.34 Describe the various types of buoys and where they are used.		
	08.35 Explain the purpose of a day mark and how it is used.		
	08.36 Explain the purpose of a range and how it is used.		
	08.37 Describe the purpose of lighthouses and their use.		
	08.38 Evaluate different port structures found on charts and their application in navigation.		
	08.39 Describe the importance of an air draft.		
09.0	Identify and explain various vessels and their and their use--The student will be able to:		
	09.16 Describe the general class of service vessels.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	09.17 Describe various types of service vessels.		
	09.18 Describe the general class of miscellaneous vessels.		
	09.19 Name two types of miscellaneous vessels.		
	09.20 Describe the function of specific miscellaneous vessels.		
	09.21 Describe various research vessels.		
	09.22 Describe various military vessels.		
11.0	Demonstrated an understanding of the business of maritime as related to shipping operations--The student will be able to:		
	11.16 Explain the functions of insurance agencies.		
	11.17 Describe the steps in processing and insurance claim.		
	11.18 Explain the purpose of a P & I club.		
12.0	Demonstrate an understanding of the business of shipping as related to port operations--The student will be able to:		
	12.22 Explain the development and personnel behind the change to containerization.		
	12.23 Describe the reasons for the success of worldwide containerization.		
	12.24 Research the impact of containerization on daily American lives.		
	12.25 Design a container terminal.		
	12.26 Describe the types of modern ship fuels.		
	12.27 Explain the evolution of ship fuels and their environmental impact.		
	12.28 Explain the ship refueling process.		
13.0	Demonstrate an understanding of various cargo and cargo management systems--The student will be able to:		
	13.12 Describe the movement of a product from abroad to an American store through the intermodal transportation process.		
	13.13 Describe different container sizes.		
	13.14 Identify different container ports and global shipping routes.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	13.15 Explain the stresses that are associated with cargo loading.		
	13.16 Define bending movements, free space, and vertical center of gravity.		
	13.17 Define hogging, sagging, and twisting as related to cargo loading.		
	13.18 Explain the use of stow plans and stability calculators.		
	13.19 Describe what makes a vessel tender of stiff in a seaway.		
14.0	Demonstrate an understanding of international trade and its impact on the world economy--The student will be able to:		
	14.20 Explain the importance of ship registries.		
	14.21 Explain the concept of flags of convenience.		
	14.22 Describe how U.S. commercial vessel ownership has changed over the years.		
15.0	Examine the legal aspects of the maritime industry--The student will be able to:		
	15.08 Describe three types of marine insurance coverage.		
	15.09 Explain the concept of duty of utmost faith.		
	15.10 Describe a warranty of seaworthiness.		
	15.11 Explain the five perils commonly covered by marine insurance.		
16.0	Explain the importance of vessel and ship security--The student will be able to:		
	16.10 Explain the role of insurance underwriters in piracy.		
	16.11 Explain the concept of terrorism at sea.		
	16.12 Describe the protocol for preparing a commercial vessel for adverse weather conditions.		
	16.13 Explain the process used by the master to avoid storms.		
	16.14 Describe the tools used by mariners in traffic during conditions of restricted visibility.		
17.0	Examine the potential and use of marine resources--The student will be able to:		
	17.16 Investigate how petroleum is found and harvested below the seafloor.		
	17.17 Explain gas hydrates and how they may be used as a source of energy.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
17.18	Investigate particle size of gravel, sand, silt, and clay.		
17.19	Explain the forces used to create different particle sizes.		
17.20	Explain the marine phosphorus cycle.		
17.21	Identify marine phosphorous deposits in the ocean.		
17.22	Identify desired minerals that are harvested from marine nodules.		
17.23	Explain marine mining methods.		
19.0	Demonstrate an understanding of the fundamentals of marine biology--The student will be able to:		
19.19	Explain the ocean food chain and how it supports healthy and clean ocean zones.		
19.20	Identify the importance of upwelling and downwelling.		
19.21	Describe how upwelling and downwelling supports ocean life.		
19.22	Analyze various ocean profiles for salinity, density, temperature, sunlight, oxygen, and organism types.		

Florida Department of Education
Student Performance Standards

Course Title: **Maritime 4**
Course Number: **8404140**
Course Credit: **1**

Course Description:
This course provides students with opportunities to further their mastery on maritime related concepts in preparation for postsecondary education and the world of work. The course builds on the material presented in Maritime 3 by increasing the depth and breadth of student knowledge.

Florida Standards			Correlation to CTE Program Standard #
20.0	Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Maritime Technology.		
	20.01 Key Ideas and Details		
	20.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. LAFS.1112.RST.1.1	
	20.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.1112.RST.1.2	
	20.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.1112.RST.1.3	
	20.02 Craft and Structure		
	20.02.1	Determine the meaning of symbols key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. LAFS.1112.RST.2.4	
	20.02.2	Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. LAFS.1112.RST.2.5	
	20.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. LAFS.1112.RST.2.6	

Florida Standards			Correlation to CTE Program Standard #
	20.03	Integration of Knowledge and Ideas	
	20.03.1	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g. quantitative data, video, multimedia) in order to address a question or solve a problem. LAFS.1112.RST.3.7	
	20.03.2	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. LAFS.1112.RST.3.8	
	20.03.3	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. LAFS.1112.RST.3.9	
	20.04	Range of Reading and Level of Text Complexity	
	20.04.1	By the end of grade 11, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	20.04.2	By the end of grade 12, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 11–CCR text complexity band independently and proficiently. LAFS.1112.RST.4.10	
21.0	Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Maritime Technology.		
	21.01	Text Types and Purposes	
	21.01.1	Write arguments focused on discipline-specific content. LAFS.1112.WHST.1.1	
	21.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.1112.WHST.1.2	
	21.02	Production and Distribution of Writing	
	21.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.1112.WHST.2.4	

Florida Standards			Correlation to CTE Program Standard #
	21.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.1112.WHST.2.5	
	21.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. LAFS.1112.WHST.2.6	
	21.03	Research to Build and Present Knowledge	
	21.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.1112.WHST.3.7	
	21.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. LAFS.1112.WHST.3.8	
	21.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.1112.WHST.3.9	
	21.04	Range of Writing	
	21.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.1112.WHST.4.10	
22.0	Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Maritime Technology.		
	22.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	
	22.02	Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
	22.03	Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	

Florida Standards	Correlation to CTE Program Standard #
22.04 Model with mathematics. MAFS.K12.MP.4.1	
22.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
22.06 Attend to precision. MAFS.K12.MP.6.1	
22.07 Look for and make use of structure. MAFS.K12.MP.7.1	
22.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
04.0 Demonstrate knowledge relating to the historical origins of the maritime industry from vessel development, cultural, and trade perspectives--The student will be able to:		
04.18 Explain various reasons why people go to sea.		
04.19 Describe the history of the whaling culture.		
05.0 Demonstrate proficiency in understanding the various career paths in the maritime industry--The student will be able to:		
05.30 Explain the training needed for careers in marine science.		
05.31 Describe the main responsibilities of a stevedore.		
05.32 Describe the main responsibilities of a salvage master.		
05.33 Describe the licensing and training required to become a salvage master.		
05.34 Explain the role of the International Salvage Union.		
05.35 Describe the main responsibilities of a commercial diver.		
05.36 Explain the training and licensing requirements for commercial divers.		
05.37 Describe the duties of a diving superintendent.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	05.38 Explain the focus on Hyperbaric Medicine.		
06.0	Demonstrate an understanding of required skills sets by mariners including, safety training, regulations, and leadership--The student will be able to:		
	06.32 Describe the purpose, function, and scope of operations of the International Maritime Organization (IMO).		
	06.33 Explain how the U.S. became a member in the IMO.		
	06.34 Explain the relationship between U.S. agencies and their regulations and the IMO conventions and treaties.		
	06.35 Describe the Marine Pollution (MARPOL) Annexes and their main functions.		
	06.36 Explain which MARPOL Annexes have been adopted by the U.S.		
	06.37 Describe the Safety of Life at Sea (SOLAS) requirements.		
	06.38 Explain the Standards for Training, Certification, and Watchstanding (STCW) and why they are needed.		
	06.39 Describe maritime aspects that are covered by the Federal Communications Commission (FCC).		
	06.40 Explain the FCC certifications that are required for mariners and vessels.		
	06.41 Describe the different types of emergencies that can occur aboard a vessel at sea or in port.		
	06.42 Explain the use of emergency plans aboard a vessel.		
	06.43 Explain the origination of the Incident Command Center.		
	06.44 Describe the involvement of the Incident Command Center at the vessel, company, state, and federal level.		
	06.45 Explain the effects of hyperthermia on the body as related to water temperature.		
	06.46 Describe the use of survival suits aboard ocean going vessels.		
	06.47 Explain fire prevention and safety precautions when dealing with fires.		
	06.48 Describe how to extinguish a fire.		
	06.49 Explain the different types of fires that can be found on ships.		
	06.50 Explain the processes for fighting each specific type of fire.		
	06.51 Explain the mariner training process for firefighting.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	06.52 Describe the use of fire escape plans and posting regulations.		
	06.53 Explain the importance of lifeboats and the practice of performing drills.		
	06.54 Explain a no sail command issued by the U.S. Coast Guard.		
	06.55 Explain the concept of seaworthiness and its legal importance.		
07.0	Demonstrate proficiency in using engineering methods for ship construction and design--The student will be able to:		
	07.41 Explain the responsibilities of a naval architect.		
	07.42 Describe and interpret drawings used in ship design and construction.		
	07.43 Explain the process of lofting.		
	07.44 Identify software used in modern engineering design.		
	07.45 Demonstrate an understanding of a lines plan.		
	07.46 Demonstrate and understanding of weld symbols.		
	07.47 Research alternative methods of ship propulsion.		
	07.48 Explain the use of complex machines.		
	07.49 Describe the function of simple machines.		
	07.50 Provide examples of simple and complex machines as used on a ship.		
	07.51 Research various incidents of vessel damage.		
	07.52 Explain the engineering process as related to the repair of damaged vessels.		
09.0	Identify and explain various vessels and their and their use--The student will be able to:		
	09.23 Describe the major global ports of call for each type of vessel.		
	09.24 Explain various reasons for specific vessel ports of call.		
10.0	Evaluate the environmental impact of the maritime industry--The student will be able to:		
	10.08 Explain the process of shoreline erosion and its impact on the maritime industry.		
	10.09 Explain the impact and function of human structures and barriers on waterways.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
10.10	Describe the changes in the chemical composition of salt water in heavy marine traffic areas.		
10.11	Describe laws designed to limit human environmental impact on marine systems.		
10.12	Describe the impact of ocean dumping on marine ecology.		
10.13	Explain the relationship between ozone depletion and phytoplankton.		
10.14	Evaluate the impact of coastal population increases on marine ecosystems.		
10.15	Explain the process of dredging and its impact on marine ecosystems.		
10.16	Evaluate the environmental impact of using long lines and netting as part of commercial fishing practice.		
11.0	Demonstrated an understanding of the business of maritime as related to shipping operations--The student will be able to:		
11.19	Explain the role of the Marine Personnel Manager.		
11.20	Explain the procurement process for materials and goods need on ships prior to voyage.		
11.21	Describe the purpose of load lines as established by the IMO.		
11.22	Calculate vessel dry cargo lift using stow factors and hold capacity.		
11.23	Calculate consumption and voyage time.		
11.24	Describe the vessel crewing process from major crew markets and training facilities.		
11.25	Explain the communication process from shore support to vessel while at sea.		
11.26	Describe the ISM/SPS codes.		
11.27	Describe how spare technical maintenance systems relate to maritime codes.		
12.0	Demonstrate an understanding of the business of shipping as related to port operations--The student will be able to:		
12.29	Describe the organization of a typical port and major functions.		
12.30	Explain the roles of engineering, real estate, operations, security, sales/marketing, finance, government relations, and executive entities in a typical port.		
12.31	Describe the roles and impact of stevedores and longshoremen.		
12.32	Explain the responsibilities of a shipping agent.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
12.33	Describe the responsibilities of a terminal operator.		
12.34	Compare a public and private terminal operator.		
12.35	Explain shipping agent authority as related to the vessel owner.		
12.36	Compare the difference between a full service shipping agent and a protective agent.		
12.37	Explain the Statement of Facts.		
12.38	Describe the disbursement account.		
12.39	Explain the role of the labor union as related to stevedores.		
12.40	Describe how the size and scope of stevedore operations impacts port operations.		
12.41	Explain the organization and function of the port authority.		
12.42	Compare operating ports and landlord ports.		
12.43	Describe the port master plan and its purpose.		
12.44	Explain the role of a port as an economic engine.		
12.45	Explain how a port authority determines rates for services, berthing, etc.		
12.46	Describe the role of real estate and its importance to the port authority.		
12.47	Explain the social impact of the port authority on the local community.		
12.48	Describe methods ports use to maintain positive customer relations with the local community.		
14.0	Demonstrate an understanding of international trade and its impact on the world economy--The student will be able to:		
14.23	Explain the factors that change the dynamic between the capacities to move goods vs. the demand for goods.		
14.24	Explain elasticity of demand for different commodity groups and how it affects freight rates.		
14.25	Describe the freight rate agreement.		
14.26	Compare contract rates and spot rates.		
14.27	Explain the role of freight brokers.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
14.28	Define the contract of affreightment and explain the main terms.		
14.29	Compare voyage and time charter agreements.		
14.30	Explain how contracts of affreightment mitigate risks involved in trade.		
14.31	Explain freight forward agreements.		
14.32	Describe the role of freight forward agreements in managing risk.		
14.33	Define the financial term of hedging as related to the maritime industry.		
14.34	Explain the role of the Baltic Exchange and in determining daily indices.		
14.35	Explain the origin, role, and purpose of the Bill of Lading.		
14.36	Explain the process of a fuel surcharge.		
14.37	Describe how the world shipbuilding orderbook affects freight rates.		
14.38	Describe three major factors that affect market conditions.		
14.39	Explain the economic effect of congestion and its impact on supply and demand.		
14.40	Explain several types of measurements for freight rates and link each to a particular cargo type.		
14.41	Calculate freight rates from multiple key elements.		
14.42	Describe the interaction between commodity prices and freight rates.		
15.0	Examine the legal aspects of the maritime industry--The student will be able to:		
15.12	Explain the Jones Act.		
15.13	Explain the legal definition of unseaworthiness.		
15.14	Explain the use of the legal term maintenance and cure.		
15.15	Explain the Longshoremen and Harbor Workers Compensation Act.		
15.16	Explain the role of the Department of Occupational Safety and Health Act.		
15.17	Describe the use of maritime liens.		
15.18	Explain how a maritime lien is enforced.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
15.19	Describe the Carriage of Goods at Sea/Harter Act.		
15.20	Explain how fault is established in a maritime casualty.		
15.21	Explain appointment of liability and how it is established.		
15.22	Defined the legal term of economic losses.		
15.23	Define the legal term of cargo losses.		
15.24	Describe the purpose and operation of maritime salvage.		
15.25	List three laws governing pollution control.		
15.26	Describe the liability and damages resultant from marine pollution.		
16.0	Explain the importance of vessel and ship security--The student will be able to:		
16.15	Describe the primary functions of the Customs and Border Patrol (CBP) and hot the agency is structure within the U.S. government.		
16.16	Explain how the CBP regulates mariners in both the U.S. and foreign flag ships.		
16.17	Describe how the CBP regulates the flow of cargoes in the U.S.		
16.18	Explain the Merchant Mariners' Document (MMD) and how it is obtained.		
17.0	Examine the potential and use of marine resources--The student will be able to:		
17.24	Describe how research studies onboard the *JOIDES Resolution* has contributed to what we know about the Earth and the oceans.		
17.25	Explain how collecting and analyzing seafloor sediment samples has helped scientist learn about the Earth and oceans.		
17.26	Compare the experiments onboard the *JOIDES Resolution* from a quantitative and qualitative perspective.		
17.27	Describe how robotic exploration has help scientists learn more about the ocean at greater depths.		
17.28	Explain the life style onboard a research vessel.		
17.29	Analyze the various land-based careers and sea-based careers that are needed to maintain research vessels.		

Additional Information

Laboratory Activities

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

Career and Technical Student Organization (CTSO)

The Florida Technology Student Association (FL-TSA) is the intercurricular career and technical student organization for providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

Cooperative Training – OJT

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

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 Occupational Completion Point (OCP) or a Modified Occupational Completion Point (MOCP). If needed, a student may enroll in the same career and technical course more than once. Documentation should be included in the IEP that clearly indicates that it is anticipated that the student may need an additional year to complete an OCP/MOCP. The student should work on different competencies and new applications of competencies each year toward completion of the OCP/MOCP. After achieving the competencies identified for the year, the student earns credit for the course. It is important to ensure that credits earned by students are reported accurately. The district's information system must be designed to accept multiple credits for the same course number for eligible students with disabilities.

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

Florida Department of Education
Curriculum Framework

Program Title: **Integrated Technology Studies**
Program Type: **Orientation/Exploratory**
Career Cluster: **Engineering & Technology Education**

Secondary – Middle School	
Program Number	8600000
CIP Number	08210122EX
Grade Level	6 - 8
Standard Length	Semester
Teacher Certification	See individual course frameworks.
CTSO	Florida Technology Student Association (FL-TSA)
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 the applications of technology and its effect upon our lives and the choosing of an occupation. The content and activities will also include the study of 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 emphasis of this program is on developing awareness of future needs, developing technological competence, confidence and awareness through interaction with technologies, developing awareness of other career programs, interacting with business, industry and community organizations, applying basic skills in learning activities, and developing self-awareness of individual abilities, needs and interests. The courses are intended to help students develop their problem-solving skills and creativity while learning about technology and careers in the Engineering & Technology Education career cluster. Students will learn to gather data through research and testing, as well as to document their results and processes.

The content includes introductory studies in areas of technology which introduce students to the development of abilities to calculate, make important observations, analyze and solve problems using manipulative skills while working cooperatively with others in team activities.

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 the courses listed below. The lengths of these courses are one semester. The same course may be offered for two semesters when appropriate. When offered for one semester, it is recommended that it be at the exploratory level and more in-depth when offered for two semesters.

Course Number	Course Title	Course Length
8600010	Introduction to Technology	Semester
8600020	Exploring Technology	Semester
8600030	Exploration of Communications Technology	Semester
8600040	Exploration of Production Technology	Semester
8600050	Exploration of Aerospace Technology	Semester
8600240	Exploration of Transportation Technology	Semester
8600250	Exploration of Power and Energy Technology	Semester

Standards

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

01.0 Demonstrate an understanding of the characteristics and scope of technology.
02.0 Demonstrate an understanding of the core concepts of technology.
03.0 Demonstrate an understanding of the relationships among technologies and the connection between technology and other fields of study.
04.0 Demonstrate an understanding of the cultural, social, economic, and political effects of technology.
05.0 Demonstrate an understanding of the effects of technology on the environment.
06.0 Demonstrate an understanding of the role of society in the development and use of technology.
07.0 Demonstrate an understanding of the influence of technology on history.
08.0 Demonstrate an understanding of the attributes of design.
09.0 Demonstrate an understanding of engineering design.
10.0 Demonstrate an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving.
11.0 Demonstrate the abilities to apply the design process.
12.0 Demonstrate the abilities to use and maintain technological products and systems.
13.0 Demonstrate the abilities to assess the impact of products and systems.
14.0 Demonstrate an understanding of and be able to select and use medical technologies.
15.0 Demonstrate an understanding of and be able to select and use agricultural and related biotechnologies.
16.0 Demonstrate an understanding of and be able to select and use energy and power technologies.
17.0 Demonstrate an understanding of and be able to select and use information and communications technologies.
18.0 Demonstrate an understanding of and be able to select and use transportation technologies.
19.0 Demonstrate an understanding of and be able to select and use manufacturing technologies.
20.0 Demonstrate an understanding of and be able to select and use construction technologies.
21.0 Demonstrate proper and safe procedures while working with technological tools, apparatus, equipment, systems, and materials.
22.0 Exhibit positive human relations and leadership skills.
23.0 Discuss individual interests, aptitudes, and opportunities as they relate to a career.
24.0 Demonstrate an application of basic electronic publishing techniques.
25.0 Identify, describe and utilize the major types of printing techniques used in print production.
26.0 Identify and demonstrate the role of electronic communication.
27.0 Identify and demonstrate the role of optical technology.
28.0 Identify evolving technologies of Production Systems.
29.0 Perform special skills unique to Manufacturing Technology.
30.0 Express knowledge of factors that impact Manufacturing Technologies and practices.
31.0 Perform special skills unique to Construction Technology.
32.0 Express knowledge of factors that impact Construction Technology and practices.
33.0 Demonstrate knowledge of the basic principles of aerostatics and aerodynamics.
34.0 Identify and demonstrate knowledge of both liquid and solid propellant rocket propulsion systems.
35.0 Define and describe the stages and forms of interference in basic satellite communication systems.
36.0 Perform special skills unique to transportation technologies.
37.0 Express knowledge of the industries that deal with transportation technology.

38.0 Perform special skills unique to power and energy technologies.
39.0 Express knowledge of the industries that deal with power and energy technology.

Florida Department of Education
Student Performance Standards

Course Title: **Introduction to Technology**
Course Number: **8600010**
Course Length: **Semester**
Teacher Certification: **TEC ED 1 @2** **ENG TEC 7G**
ENG @7 7G

Course Description:
The purpose of this course is to give students an introduction to the areas of technology and to introduce students to the design and problem solving processes using manipulative skills while working cooperatively with others in team activities.

CTE Standards and Benchmarks	
01.0	Demonstrate an understanding of the characteristics and scope of technology. – The student will be able to:
01.01	Develop new products and systems to solve problems or to help do things that could not be done without the help of technology.
01.02	Describe the development of technology as a human activity that is the result of individual or collective needs and the ability to be creative.
01.03	Explain how technology is closely linked with creativity, which has resulted in innovation.
02.0	Demonstrate an understanding of the core concepts of technology. – The student will be able to:
02.01	Identify technological systems including input, processes, output, and, at times, feedback.
02.02	Define systems thinking, involving considering how every part relates to others.
02.03	Identify control systems having no feedback path and requiring human intervention, and control system using feedback.
02.04	Identify how technological systems can be connected to one another.
02.05	Diagnose malfunctions of any part of a system that may affect the function and quality of the system.
02.06	Identify requirements or parameters placed on the development of a product or system.
02.07	Identify trade-offs as a decision process recognizing the need for careful compromises among competing factors.
02.08	Identify different technologies that involve different sets of processes.
02.09	Define maintenance as the process of inspecting and servicing a product or system on a regular basis in order for it to continue functioning properly, to extend its life, or to upgrade its capability.

CTE Standards and Benchmarks	
03.0	Demonstrate an understanding of the relationships among technologies and the connection between technology and other fields of study. – The student will be able to:
03.01	Explain how technological systems interact with one another.
03.02	Explain how knowledge gained from other fields of study has a direct effect on the development of technological products and systems.
04.0	Demonstrate an understanding of the cultural, social, economic, and political effects of technology. – The student will be able to:
04.01	Identify the ways that use of technology affects humans, including their safety, comfort, choices, and attitudes about technology's development and use.
04.02	Explain that technology, by itself, is neither good nor bad; but decisions about the use of products and systems can result in desirable or undesirable consequences.
04.03	Identify ethical issues associated with the development and use of technology.
04.04	Identify the economic, political, and cultural issues that are influenced by the development and use of technology.
05.0	Demonstrate an understanding of the effects of technology on the environment. – The student will be able to:
05.01	Describe the management of waste produced by technological systems as an important societal issue.
05.02	Identify how technologies can be used to repair damage caused by natural disasters and to break down waste from the use of various products and systems.
06.0	Demonstrate an understanding of the role of society in the development and use of technology. – The student will be able to:
06.01	Identify the development of technologies that has resulted from the demands, values, and interests of individuals, businesses, industries, and societies.
06.02	Identify changes in society and the creation of new needs and wants caused by the use of inventions and innovations.
07.0	Demonstrate an understanding of the influence of technology on history. – The student will be able to:
07.01	Identify inventions and innovations that have evolved by using slow and methodical processes of tests and refinements.
07.02	Explain how the specialization of function has been at the heart of many technological improvements.
08.0	Demonstrate an understanding of the attributes of design. – The student will be able to:
08.01	Use design as a creative planning process that leads to useful products and systems.
08.02	Explain why there is no perfect design.
08.03	Identify criteria and constraints that are requirements for a design.
09.0	Demonstrate an understanding of engineering design. – The student will be able to:

CTE Standards and Benchmarks	
	09.01 Document the design process involving a set of steps, which can be performed in different sequences and repeated as needed.
	09.02 Define brainstorming as a group problem-solving design process in which each person in the group presents his or her ideas in an open forum.
	09.03 Model, test, evaluate and modify designs to transform ideas into practical solutions.
10.0	Demonstrate an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving. – The student will be able to:
	10.01 Use troubleshooting as a problem-solving method used to identify the cause of a malfunction in a technological system.
	10.02 Define invention as a process of turning ideas and imagination into devices and systems and innovation as the process of modifying an existing product or system to improve it.
	10.03 Identify technological problems that are best solved through experimentation.
11.0	Demonstrate the abilities to apply the design process. – The student will be able to:
	11.01 Apply a design process to solve problems in and beyond the laboratory-classroom.
	11.02 Specify criteria and constraints for the design.
	11.03 Make two-dimensional and three-dimensional representations of the designed solution.
	11.04 Test and evaluate the design in relation to pre-established requirements, such as criteria and constraints, and refine as needed.
	11.05 Make a product or system and document the solution.
12.0	Demonstrate the abilities to use and maintain technological products and systems. – The student will be able to:
	12.01 Use information provided in manuals, protocols, or by experienced people to see and understand how things work.
	12.02 Use tools, materials, and machines safely to diagnose, adjust, and repair systems.
	12.03 Use computers and calculators in various applications.
	12.04 Operate and maintain systems in order to achieve a given purpose.
13.0	Demonstrate the abilities to assess the impact of products and systems. – The student will be able to:
	13.01 Design and use instruments to gather data.
	13.02 Use data collected to analyze and interpret trends in order to identify the positive or negative effects of a technology.
	13.03 Identify trends and monitor potential consequences of technological development.

CTE Standards and Benchmarks	
	13.04 Interpret and evaluate the accuracy of the information obtained and determine if it is useful.
14.0	Demonstrate an understanding of and be able to select and use medical technologies. – The student will be able to:
	14.01 Identify how sanitation processes used in the disposal of medical products help to protect people from harmful organisms and disease, and shape the ethics of medical safety.
	14.02 Explain how the vaccines developed for use in immunization require specialized technologies to support environments in which a sufficient amount of vaccines are produced.
15.0	Demonstrate an understanding of and be able to select and use agricultural and related biotechnologies. – The student will be able to:
	15.01 Identify technological advances in agriculture directly affecting the time and number of people required to produce food for a large population.
	15.02 Identify how a wide range of specialized equipment and practices is used to improve the production of food, fiber, fuel, and other useful products and in the care of animals.
	15.03 Explain how biotechnology applies the principles of biology to create commercial products or processes.
16.0	Demonstrate an understanding of and be able to select and use energy and power technologies. – The student will be able to:
	16.01 Define energy as the capacity to do work.
	16.02 Explain how energy can be used to do work, using many processes.
	16.03 Define power as the rate at which energy is converted from one form to another or transferred from one place to another, or the rate at which work is done.
	16.04 Define power systems used to drive and provide propulsion to other technological products and systems.
	16.05 Explain how much of the energy used in our environment is not used efficiently.
17.0	Demonstrate an understanding of and be able to select and use information and communication technologies. – The student will be able to:
	17.01 Identify information and communication systems that allow information to be transferred from human to human, human to machine, machine to machine, and machine to human.
	17.02 Define communication systems made up of a source, encoder, transmitter, receiver, decoder, and destination.
	17.03 Identify factors that influence the design of a message, such as the intended audience, medium, purpose, and nature of the message.
	17.04 Use symbols, measurements, and drawings to promote clear communication by providing a common language to express ideas.
18.0	Demonstrate an understanding of and be able to select and use transportation technologies. – The student will be able to:
	18.01 Describe how transporting people and goods involve a combination of individuals and vehicles.

CTE Standards and Benchmarks	
	18.02 Identify subsystems of transportation vehicles, such as structural, propulsion, suspension, guidance, control, and support that must function together for a system to work effectively.
19.0	Demonstrate an understanding of and be able to select and use manufacturing technologies. – The student will be able to:
	19.01 Define manufacturing systems using mechanical processes that change the form of materials through processes of separating, forming, combining, and conditioning them.
	19.02 Classify manufactured goods as durable and non-durable.
	19.03 Document the manufacturing process including the designing, development, making, and servicing of products and systems.
	19.04 Define manufacturing technologies that are used to modify or alter manufactured products.
	19.05 Explain that materials must first be located before they can be extracted from the earth through processes such as harvesting, drilling, and mining.
20.0	Demonstrate an understanding of and be able to select and use construction technologies. – The student will be able to:
	20.01 Research building laws and codes.
	20.02 Identify factors such as style, convenience, cost, climate, and function in the selection of designs for structures.
	20.03 Explain that structures rest on a foundation.
	20.04 Classify structures as temporary or permanent.
	20.05 Identify subsystems of a building.
21.0	Demonstrate proper and safe procedures while working with technological tools, apparatus, equipment, systems, and materials. – The student will be able to:
	21.01 Follow laboratory safety rules and procedures.
	21.02 Demonstrate good housekeeping at workstations within a total laboratory.
	21.03 Conduct laboratory activities and equipment operations in a safe manner.
	21.04 Exercise care and respect for all tools, equipment, and materials.
	21.05 Identify color-coding safety standards.
	21.06 Safely use hand tools and power equipment.
	21.07 Explain fire prevention and safety precautions and practices for extinguishing fires.
	21.08 Identify harmful effects/potential dangers of familiar hazardous substances/devices to people and the environment.

CTE Standards and Benchmarks	
22.0	Exhibit positive human relations and leadership skills. – The student will be able to:
22.01	Perform roles in a student personnel system or in the Florida Technology Student Association (FL-TSA).
22.02	Work cooperatively with others.
23.0	Discuss individual interests, aptitudes, and opportunities as they relate to a career. – The student will be able to:
23.01	Describe individual strengths and weaknesses.
23.02	Discuss individual interests related to a career.
23.03	Identify careers within specific areas of technology.
23.04	Explore careers within specific areas of interest.

Florida Department of Education
Student Performance Standards

Course Title: **Exploring Technology**
Course Number: **8600020**
Course Length: **Semester**
Teacher Certification: **TEC ED 1 @2** **ENG TEC 7G**
ENG @7 7G

Course Description:
The purpose of this course is to give students an opportunity to explore the areas of technology and associated careers available in technical fields. Students will be given the opportunity to solve technological problems while gaining an understanding of the effects of technology on our everyday lives.

CTE Standards and Benchmarks	
01.0	Demonstrate an understanding of the characteristics and scope of technology. – The student will be able to:
01.01	Develop new products and systems to solve problems or to help do things that could not be done without the help of technology.
01.02	Describe the development of technology as a human activity that is the result of individual or collective needs and the ability to be creative.
01.03	Explain how technology is closely linked with creativity, which has resulted in innovation.
01.04	Demonstrate how corporations can often create demand for a product by bringing it onto the market and advertising it.
02.0	Demonstrate an understanding of the core concepts of technology. – The student will be able to:
02.01	Describe technological systems including input, processes, output, and, at times, feedback.
02.02	Apply systems thinking, involving considering how every part relates to others.
02.03	Identify control systems having no feedback path and requiring human intervention, and control systems using feedback.
02.04	Explain how technological systems can be connected to one another.
02.05	Repair malfunctions of any part of a system that may affect the function and quality of the system.
02.06	Compare and contrast requirements or parameters placed on the development of a product or system.
02.07	Compare and contrast trade-offs as a decision process recognizing the need for careful compromises among competing factors.
02.08	Describe different technologies that involve different sets of processes.

CTE Standards and Benchmarks	
	02.09 Perform basic maintenance as the process of inspecting and servicing a product or system on a regular basis in order for it to continue functioning properly, to extend its life, or to upgrade its capability.
	02.10 Utilize controls and mechanisms or particular steps that people perform using information about the system that causes systems to change.
03.0	Demonstrate an understanding of the relationships among technologies and the connection between technology and other fields of study. – The student will be able to:
	03.01 Modify the way technological systems interact with one another.
	03.02 Apply a product, system, or environment developed for one setting in another setting.
	03.03 Explain how knowledge gained from other fields of study has a direct effect on the development of technological products and systems.
04.0	Demonstrate an understanding of the cultural, social, economic, and political effects of technology. – The student will be able to:
	04.01 Describe ethical issues associated with the development and use of technology.
	04.02 Describe the economic, political, and cultural issues that are influenced by the development and use of technology.
05.0	Demonstrate an understanding of the effects of technology on the environment. – The student will be able to:
	05.01 Describe the management of waste produced by technological systems as an important societal issue.
	05.02 Describe how technologies can be used to repair damage caused by natural disasters and to break down waste from the use of various products and systems.
	05.03 Make decisions about the development and use of technologies that put environmental and economic concerns in direct competition with one another.
06.0	Demonstrate an understanding of the role of society in the development and use of technology. – The student will be able to:
	06.01 Describe the development of technologies that has resulted from the demands, values, and interests of individuals, businesses, industries, and societies.
	06.02 Describe changes in society and the creation of new needs and wants caused by the use of inventions and innovations.
	06.03 Describe social and cultural priorities and values that are reflected in technological devices.
	06.04 Explain how meeting societal expectations is the driving force behind the acceptance and use of products and systems.
07.0	Demonstrate an understanding of the influence of technology on history. – The student will be able to:
	07.01 Describe inventions and innovations that have evolved by using slow and methodical processes of tests and refinements.
	07.02 Explain how the specialization of function has been at the heart of many technological improvements.
	07.03 Describe the design and construction of structures for service or convenience evolving from the development of techniques for measurement, controlling systems, and the understanding of spatial relationships.

CTE Standards and Benchmarks	
08.0	Demonstrate an understanding of the attributes of design. – The student will be able to:
08.01	Use design as a creative planning process that leads to useful products and systems.
08.02	Explain why there is no perfect design.
08.03	Evaluate criteria and constraints that are requirements for a design.
09.0	Demonstrate an understanding of engineering design. – The student will be able to:
09.01	Utilize the design process involving a set of steps, which can be performed in different sequences and repeated as needed.
09.02	Employ brainstorming as a group problem-solving design process in which each person in the group presents his or her ideas in an open forum.
09.03	Model, test, evaluate and modify designs to transform ideas into practical solutions.
10.0	Demonstrate an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving. – The student will be able to:
10.01	Use troubleshooting as a problem-solving method used to identify the cause of a malfunction in a technological system.
10.02	Describe invention as a process of turning ideas and imagination into devices and systems and innovation as the process of modifying an existing product or system to improve it.
10.03	Identify technological problems that are best solved through experimentation.
11.0	Demonstrate the abilities to apply the design process. – The student will be able to:
11.01	Apply a design process to solve problems in and beyond the laboratory-classroom.
11.02	Specify criteria and constraints for the design.
11.03	Make two-dimensional and three-dimensional representations of the designed solution.
11.04	Test and evaluate the design in relation to pre-established requirements, such as criteria and constraints, and refine as needed.
11.05	Make a product or system and document the solution.
12.0	Demonstrate the abilities to use and maintain technological products and systems. – The student will be able to:
12.01	Use information provided in manuals, protocols, or by experienced people to see and understand how things work.
12.02	Use tools, materials, and machines safely to diagnose, adjust, and repair systems.
12.03	Use computers and calculators in various applications.

CTE Standards and Benchmarks	
	12.04 Operate and maintain systems in order to achieve a given purpose.
13.0	Demonstrate the abilities to assess the impact of products and systems. – The student will be able to:
	13.01 Design and use instruments to gather data.
	13.02 Use data collected to analyze and interpret trends in order to identify the positive or negative effects of a technology.
	13.03 Identify trends and monitor potential consequences of technological development.
	13.04 Interpret and evaluate the accuracy of the information obtained and determine if it is useful.
14.0	Demonstrate an understanding of and be able to select and use medical technologies. – The student will be able to:
	14.01 Describe how advances and innovations in medical technologies are used to improve healthcare.
	14.02 Describe how sanitation processes used in the disposal of medical products help to protect people from harmful organisms and disease, and shape the ethics of medical safety.
	14.03 Explain how the vaccines developed for use in immunization require specialized technologies to support environments in which a sufficient amount of vaccines are produced.
	14.04 Describe genetic engineering involving modifying the structure of DNA to produce novel genetic make-ups.
15.0	Demonstrate an understanding of and be able to select and use agricultural and related biotechnologies. – The student will be able to:
	15.01 Describe technological advances in agriculture directly affecting the time and number of people required to produce food for a large population.
	15.02 Describe how a wide range of specialized equipment and practices is used to improve the production of food, fiber, fuel, and other useful products and in the care of animals.
	15.03 Explain how biotechnology applies the principles of biology to create commercial products or processes.
	15.04 Create artificial ecosystems that are human-made complexes that replicate some aspects of natural environments.
	15.05 Explain how the development of refrigeration, freezing, dehydration, preservation, and irradiation provide long-term storage of food and reduce the health risks caused by tainted food.
16.0	Demonstrate an understanding of and be able to select and use energy and power technologies. – The student will be able to:
	16.01 Define energy as the capacity to do work.
	16.02 Explain how energy can be used to do work, using many processes.
	16.03 Define power as the rate at which energy is converted from one form to another or transferred from one place to another, or the rate at which work is done.
	16.04 Describe power systems used to drive and provide propulsion to other technological products and systems.

CTE Standards and Benchmarks	
	16.05 Explain how much of the energy used in our environment is not used efficiently.
17.0	Demonstrate an understanding of and be able to select and use information and communication technologies. – The student will be able to:
	17.01 Create information and communication systems that allow information to be transferred from human to human, human to machine, machine to machine, and machine to human.
	17.02 Describe communication systems made up of a source, encoder, transmitter, receiver, decoder, and destination.
	17.03 Consider factors that influence the design of a message, such as the intended audience, medium, purpose, and nature of the message.
	17.04 Use symbols, measurements, and drawings to promote clear communication by providing a common language to express ideas.
18.0	Demonstrate an understanding of and be able to select and use transportation technologies. – The student will be able to:
	18.01 Describe how transporting people and goods involve a combination of individuals and vehicles.
	18.02 Describe subsystems of transportation vehicles, such as structural, propulsion, suspension, guidance, control, and support that must function together for a system to work effectively.
	18.03 Identify governmental regulations that influence the design and operation of transportation systems.
	18.04 Identify processes, such as receiving, holding, storing, loading, moving, unloading, delivering, evaluating, marketing, managing, communicating, and using conventions that are necessary for the entire transportation system to operate efficiently.
19.0	Demonstrate an understanding of and be able to select and use manufacturing technologies. – The student will be able to:
	19.01 Describe manufacturing systems using mechanical processes that change the form of materials through processes of separating, forming, combining, and conditioning them.
	19.02 Classify manufactured goods as durable and non-durable.
	19.03 Employ the manufacturing process including the designing, development, making, and servicing of products and systems.
	19.04 Describe manufacturing technologies that are used to modify or alter manufactured products.
	19.05 Explain that materials must first be located before they can be extracted from the earth through processes such as harvesting, drilling, and mining.
20.0	Demonstrate an understanding of and be able to select and use construction technologies. – The student will be able to:
	20.01 Research building laws and codes.
	20.02 Identify factors such as style, convenience, cost, climate, and function in the selection of designs for structures.
	20.03 Explain that structures rest on a foundation.
	20.04 Classify structures as temporary or permanent.

CTE Standards and Benchmarks	
	20.05 Describe subsystems of a building.
21.0	Demonstrate proper and safe procedures while working with technological tools, apparatus, equipment, systems, and materials. – The student will be able to:
	21.01 Follow laboratory safety rules and procedures.
	21.02 Demonstrate good housekeeping at workstations within a total laboratory.
	21.03 Conduct laboratory activities and equipment operations in a safe manner.
	21.04 Identify tools, machines, materials and equipment and describe their functions.
	21.05 Select appropriate tools, machines, and equipment to accomplish a given task.
	21.06 Demonstrate safe and correct use of tools, machines, and equipment.
	21.07 Identify color-coding safety standards.
	21.08 Explain fire prevention and safety precautions and practices for extinguishing fires.
	21.09 Identify harmful effects/potential dangers of familiar hazardous substances/devices to people and the environment.
22.0	Exhibit positive human relations and leadership skills. – The student will be able to:
	22.01 Perform roles in a student personnel system or in the Florida Technology Student Association (FL-TSA).
	22.02 Work cooperatively with others.
23.0	Discuss individual interests, aptitudes, and opportunities as they relate to a career. – The student will be able to:
	23.01 Identify individual strengths and weaknesses.
	23.02 Discuss individual interests related to a career.
	23.03 Identify careers within specific areas of technology.
	23.04 Explore careers within specific areas of interest.
	23.05 Form an understanding and appreciation for work after listening to or observing technology workers.
	23.06 Form an understanding and appreciation for work after participating in a simulated technology group project in the laboratory.
	23.07 Form an understanding and appreciation for the roles and work of co-workers.

Florida Department of Education
Student Performance Standards

Course Title: **Exploration of Communications Technology**
Course Number: **8600030**
Course Length: **Semester**
Teacher Certification: **TEC ED 1 @2** **PRINTING @7 7G**
GRAPH ARTS @4 **COMM ART @7 7G** **ENG @7 7G**

Course Description:
The purpose of this course is to give students an opportunity to explore the area of communications technology and its associated careers. Students will be given the opportunity to solve technological problems using a variety of tools, materials, processes and systems while gaining an understanding of the effects of communications technology on our everyday lives. A list of minimum tools and equipment to implement this course is located at the end of this framework.

CTE Standards and Benchmarks	
01.0	Demonstrate an understanding of the characteristics and scope of technology. – The student will be able to:
01.01	Develop new products and systems to solve problems or to help do things that could not be done without the help of technology.
01.02	Describe the development of technology as a human activity that is the result of individual or collective needs and the ability to be creative.
01.03	Explain how technology is closely linked with creativity, which has resulted in innovation.
01.04	(Explain, Demonstrate) how corporations can often create demand for a product by bringing it onto the market and advertising it.
02.0	Demonstrate an understanding of the core concepts of technology. – The student will be able to:
02.01	Identify technological systems including input, processes, output, and, at times, feedback.
02.02	Apply systems thinking, involving considering how every part relates to others.
03.0	Demonstrate an understanding of the relationships among technologies and the connection between technology and other fields of study. – The student will be able to:
03.01	Modify the way technological systems interact with one another.
03.02	Apply a product, system, or environment developed for one setting in another setting.
03.03	Explain how knowledge gained from other fields of study has a direct effect on the development of technological products and systems.
04.0	Demonstrate an understanding of the cultural, social, economic, and political effects of technology. – The student will be able to:

CTE Standards and Benchmarks	
04.01	Describe the ways that use of technology affects humans, including their safety, comfort, choices, and attitudes about technology's development and use.
04.02	Explain that technology, by itself, is neither good nor bad; but decisions about the use of products and systems can result in desirable or undesirable consequences.
04.03	Describe ethical issues associated with the development and use of technology.
04.04	Describe the economic, political, and cultural issues that are influenced by the development and use of technology.
05.0	Demonstrate an understanding of the effects of technology on the environment. – The student will be able to:
05.01	Describe the management of waste produced by technological systems as an important societal issue.
05.02	Identify how technologies can be used to repair damage caused by natural disasters and to break down waste from the use of various products and systems.
05.03	Make decisions about the development and use of technologies that put environmental and economic concerns in direct competition with one another.
06.0	Demonstrate an understanding of the role of society in the development and use of technology. – The student will be able to:
06.01	Describe the development of technologies that has resulted from the demands, values, and interests of individuals, businesses, industries, and societies.
06.02	Describe changes in society and the creation of new needs and wants caused by the use of inventions and innovations.
06.03	Describe social and cultural priorities and values that are reflected in technological devices.
06.04	Explain how meeting societal expectations is the driving force behind the acceptance and use of products and systems.
07.0	Demonstrate an understanding of the influence of technology on history. – The student will be able to:
07.01	Describe inventions and innovations that have evolved by using slow and methodical processes of tests and refinements.
07.02	Explain how the specialization of function has been at the heart of many technological improvements.
07.03	Explain that in the past, an invention or innovation was not usually developed with the knowledge of science.
08.0	Demonstrate an understanding of the attributes of design. – The student will be able to:
08.01	Use design as a creative planning process that leads to useful products and systems.
08.02	Explain why there is no perfect design.
08.03	Evaluate criteria and constraints that are requirements for a design.
09.0	Demonstrate an understanding of engineering design. – The student will be able to:

CTE Standards and Benchmarks	
	09.01 Utilize the design process involving a set of steps, which can be performed in different sequences and repeated as needed.
	09.02 Employ brainstorming as a group problem-solving design process in which each person in the group presents his or her ideas in an open forum.
	09.03 Model, test, evaluate and modify designs to transform ideas into practical solutions.
10.0	Demonstrate an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving. – The student will be able to:
	10.01 Use troubleshooting as a problem-solving method used to identify the cause of a malfunction in a technological system.
	10.02 Describe invention as a process of turning ideas and imagination into devices and systems and innovation as the process of modifying an existing product or system to improve it.
	10.03 Identify technological problems that are best solved through experimentation.
11.0	Demonstrate the abilities to apply the design process. – The student will be able to:
	11.01 Apply a design process to solve problems in and beyond the laboratory-classroom.
	11.02 Specify criteria and constraints for the design.
	11.03 Make two-dimensional and three-dimensional representations of the designed solution.
	11.04 Test and evaluate the design in relation to pre-established requirements, such as criteria and constraints, and refine as needed.
	11.05 Make a product or system and document the solution.
12.0	Demonstrate the abilities to use and maintain technological products and systems. – The student will be able to:
	12.01 Use information provided in manuals, protocols, or by experienced people to see and understand how things work.
	12.02 Use tools, materials, and machines safely to diagnose, adjust, and repair systems.
	12.03 Use computers and calculators in various applications.
	12.04 Operate and maintain systems in order to achieve a given purpose.
13.0	Demonstrate the abilities to assess the impact of products and systems. – The student will be able to:
	13.01 Design and use instruments to gather data.
	13.02 Use data collected to analyze and interpret trends in order to identify the positive or negative effects of a technology.
	13.03 Identify trends and monitor potential consequences of technological development.

CTE Standards and Benchmarks	
	13.04 Interpret and evaluate the accuracy of the information obtained and determine if it is useful.
17.0	Demonstrate an understanding of and be able to select and use information and communication technologies. – The student will be able to:
	17.01 Create information and communication systems that allow information to be transferred from human to human, human to machine, machine to machine, and machine to human.
	17.02 Describe communication systems made up of a source, encoder, transmitter, receiver, decoder, and destination.
	17.03 Consider factors that influence the design of a message, such as the intended audience, medium, purpose, and nature of the message.
	17.04 Use symbols, measurements, and drawings to promote clear communication by providing a common language to express ideas.
19.0	Demonstrate an understanding of and be able to select and use manufacturing technologies. – The student will be able to:
	19.01 Describe manufacturing systems using mechanical processes that change the form of materials through processes of separating, forming, combining, and conditioning them.
	19.02 Employ the manufacturing process including the designing, development, making, and servicing of products and systems.
21.0	Demonstrate proper and safe procedures while working with technological tools, apparatus, equipment, systems, and materials. – The student will be able to:
	21.01 Follow laboratory safety rules and procedures.
	21.02 Demonstrate good housekeeping at workstations within a total laboratory.
	21.03 Conduct laboratory activities and equipment operations in a safe manner.
	21.04 Identify tools, machines, materials and equipment and describe their functions.
	21.05 Select appropriate tools, machines, and equipment to accomplish a given task.
	21.06 Demonstrate safe and correct use of tools, machines, and equipment.
	21.07 Identify color-coding safety standards.
	21.08 Explain fire prevention and safety precautions and practices for extinguishing fires.
	21.09 Identify harmful effects/potential dangers of familiar hazardous substances/devices to people and the environment.
22.0	Exhibit positive human relations and leadership skills. – The student will be able to:
	22.01 Perform roles in a student personnel system or in the Florida Technology Student Association (FL-TSA).
	22.02 Work cooperatively with others.

CTE Standards and Benchmarks	
23.0	Discuss individual interests and aptitudes as they relate to a career. – The student will be able to:
23.01	Identify individual strengths and weaknesses.
23.02	Discuss individual interests related to a career.
23.03	List occupations, job requirements, and job opportunities in communication technology.
23.04	List academic and career programs at the secondary levels in communication technology.
24.0	Demonstrate an application of basic electronic publishing techniques. – The student will be able to:
24.01	Utilize electronic publishing to combine input, editing, and output into a finished product.
24.02	Utilize the components of layouts including type, typography and illustration to electronically manipulate the elements of a published product.
24.03	Develop a web page using appropriate electronic software.
24.04	Create a document on an electronic publishing system by inputting existing digitized graphics or by digitizing original art or photographs on a digitizing scanner.
25.0	Identify, describe and utilize the major types of printing techniques used in print production. – The student will be able to:
25.01	Identify and explain standard printing processes including but not limited to: relief, gravure, screen process, and lithographic printing.
25.02	Utilize common design principles to create camera ready art.
25.03	Produce a printed product using a current printing method.
25.04	Utilize appropriate finishing techniques on a printed project.
26.0	Identify and demonstrate the role of electronic communication. – The student will be able to:
26.01	Explain how to create code, transmit, and receive messages using electronic devices.
26.02	List and explain the common communication categories.
26.03	Define and explain the use of telecommunications in everyday life.
26.04	Utilize a telecommunications device to transmit and receive an electronic message.
26.05	Produce an audio and/or visual product using electronic communication technology.
27.0	Identify and demonstrate the role of optical technology. – The student will be able to:

CTE Standards and Benchmarks	
27.01	Identify the purposes and property of light as used in communication technology.
27.02	Explain how light signals are transmitted and received via different optical devices to include but not limited to: fiber optics, satellite communication, bandwidth, laser, and photography.
27.03	Generate a product using optical technology.

***** Minimum Equipment and Tool needs for an Exploration of Communications Technology Course *****

1. Affiliation to the Technology Student Association with Competitive Events Book
2. 15 computer stations (to create a 2 students/computer ratio) complete with built in CD-ROM drive; appropriate furniture; lockdowns, and chairs
3. Class set plus 5 (33): textbooks; dictionaries; safety goggles; rubber aprons; rubber gloves; rulers; T squares; drafting tables; appropriate height stools; French curves; compasses; protractors; per each student each year: erasers, appropriate drawing pencils, tape, drafting brushes
4. Software (all to include site licenses): CAD; web page; publishing; design; word processing; office management; Photoshop or equal; illustrator or equal; 3D animation
5. Two 11X17 color inkjet printers
6. Internet access to the entire lab
7. Safety video
8. Disinfecting cabinet (for safety goggles)
9. One teacher computer station with an ergonomic chair (height adjustable, cushioned, on wheels)
10. One teacher desk
11. One white board with a beginning set of multicolored board markers
12. One overhead projector
13. One RF Modulator (to turn TV into a computer screen)
14. One current Occupational Outlook Handbook
15. One scanner
16. Three digital cameras
17. Two video cameras
18. Video editing equipment package
19. Audio broadcast package
20. Risographic type printing equipment package
21. Vinyl sign maker with materials package
22. Thermal screen maker with materials package
23. Four color unit for screen printing
24. Screen printing dryer
25. Heat press for transfers
26. Fifteen 6-foot folding work tables or better
27. 30 chairs
28. One set of basic mechanics/carpenters hand tools with storage

29. 3-4 AV Carts
30. Class set of calculators
31. Binding Machine; binding coils and padding compound
32. Heavy-duty hole press for 100 pages.
33. Electric stapler
34. 6 electric pencil sharpeners
35. Paper cutter 11 x 17
36. Desktop copy machine
37. 3 Light Tables
38. Laser & Fiber Optic equipment

Florida Department of Education
Student Performance Standards

Course Title: **Exploration of Production Technology**
Course Number: **8600040**
Course Length: **Semester**
Teacher Certification: **METAL WORK 7G** **ENG @7 7G** **TEC ED 1 @2** **CARPENTRY @7 7G**
TEC CONSTR @7 7G **BLDG MAINT @7 7G** **BLDG CONST @7 7G**

Course Description:
The purpose of this course is to give students an opportunity to explore the area of production technology and its associated careers. Students will be given the opportunity to solve technological problems using a variety of tools, materials, processes and systems while gaining an understanding of the effects of production technology on our everyday lives.

CTE Standards and Benchmarks	
01.0	Demonstrate an understanding of the characteristics and scope of technology. – The student will be able to:
01.01	Develop new products and systems to solve problems or to help do things that could not be done without the help of technology.
01.02	Describe the development of technology as a human activity that is the result of individual or collective needs and the ability to be creative.
01.03	Explain how technology is closely linked with creativity, which has resulted in innovation.
01.04	Demonstrate how corporations can often create demand for a product by bringing it onto the market and advertising it.
02.0	Demonstrate an understanding of the core concepts of technology. – The student will be able to:
02.01	Describe technological systems including input, processes, output, and, at times, feedback.
02.02	Apply systems thinking, involving considering how every part relates to others.
02.03	Identify control systems having no feedback path and requiring human intervention, and control system using feedback.
02.04	Explain how technological systems can be connected to one another.
02.05	Repair malfunctions of any part of a system that may affect the function and quality of the system.
02.06	Compare and contrast requirements or parameters placed on the development of a product or system.
02.07	Compare and contrast trade-offs as a decision process recognizing the need for careful compromises among competing factors.
02.08	Perform basic maintenance as the process of inspecting and servicing a product or system on a regular basis in order for it to continue functioning properly, to extend its life, or to upgrade its capability.

CTE Standards and Benchmarks	
	02.09 Utilize controls and mechanisms or particular steps that people perform using information about the system that causes systems to change.
03.0	Demonstrate an understanding of the relationships among technologies and the connection between technology and other fields of study. – The student will be able to:
	03.01 Modify the way technological systems interact with one another.
	03.02 Explain how knowledge gained from other fields of study has a direct effect on the development of technological products and systems.
04.0	Demonstrate an understanding of the cultural, social, economic, and political effects of technology. – The student will be able to:
	04.01 Describe the ways that use of technology affects humans, including their safety, comfort, choices, and attitudes about technology's development and use.
	04.02 Explain that technology, by itself, is neither good nor bad; but decisions about the use of products and systems can result in desirable or undesirable consequences.
	04.03 Describe ethical issues associated with the development and use of technology.
	04.04 Describe the economic, political, and cultural issues that are influenced by the development and use of technology.
05.0	Demonstrate an understanding of the effects of technology on the environment. – The student will be able to:
	05.01 Describe the management of waste produced by technological systems as an important societal issue.
	05.02 Describe how technologies can be used to repair damage caused by natural disasters and to break down waste from the use of various products and systems.
	05.03 Make decisions about the development and use of technologies that put environmental and economic concerns in direct competition with one another.
06.0	Demonstrate an understanding of the role of society in the development and use of technology. – The student will be able to:
	06.01 Describe the development of technologies that has resulted from the demands, values, and interests of individuals, businesses, industries, and societies.
	06.02 Describe changes in society and the creation of new needs and wants caused by the use of inventions and innovations.
	06.03 Describe social and cultural priorities and values that are reflected in technological devices.
	06.04 Explain how meeting societal expectations is the driving force behind the acceptance and use of products and systems.
07.0	Demonstrate an understanding of the influence of technology on history. – The student will be able to:
	07.01 Describe inventions and innovations that have evolved by using slow and methodical processes of tests and refinements.
	07.02 Explain how the specialization of function has been at the heart of many technological improvements.
	07.03 Explain that in the past, an invention or innovation was not usually developed with the knowledge of science.

CTE Standards and Benchmarks	
08.0	Demonstrate an understanding of the attributes of design. – The student will be able to:
08.01	Use design as a creative planning process that leads to useful products and systems.
08.02	Explain why there is no perfect design.
08.03	Evaluate criteria and constraints that are requirements for a design.
09.0	Demonstrate an understanding of engineering design. – The student will be able to:
09.01	Utilize the design process involving a set of steps, which can be performed in different sequences and repeated as needed.
09.02	Employ brainstorming as a group problem-solving design process in which each person in the group presents his or her ideas in an open forum.
09.03	Model, test, evaluate and modify designs to transform ideas into practical solutions.
10.0	Demonstrate an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving. – The student will be able to:
10.01	Use troubleshooting as a problem-solving method used to identify the cause of a malfunction in a technological system.
10.02	Describe invention as a process of turning ideas and imagination into devices and systems and innovation as the process of modifying an existing product or system to improve it.
10.03	Identify technological problems that are best solved through experimentation.
11.0	Demonstrate the abilities to apply the design process. – The student will be able to:
11.01	Apply a design process to solve problems in and beyond the laboratory-classroom.
11.02	Specify criteria and constraints for the design.
11.03	Make two-dimensional and three-dimensional representations of the designed solution.
11.04	Test and evaluate the design in relation to pre-established requirements, such as criteria and constraints, and refine as needed.
11.05	Make a product or system and document the solution.
12.0	Demonstrate the abilities to use and maintain technological products and systems. – The student will be able to:
12.01	Use information provided in manuals, protocols, or by experienced people to see and understand how things work.
12.02	Use tools, materials, and machines safely to diagnose, adjust, and repair systems.
12.03	Use computers and calculators in various applications.

CTE Standards and Benchmarks	
	12.04 Operate and maintain systems in order to achieve a given purpose.
13.0	Demonstrate the abilities to assess the impact of products and systems. – The student will be able to:
	13.01 Design and use instruments to gather data.
	13.02 Use data collected to analyze and interpret trends in order to identify the positive or negative effects of a technology.
	13.03 Identify trends and monitor potential consequences of technological development.
	13.04 Interpret and evaluate the accuracy of the information obtained and determine if it is useful.
19.0	Demonstrate an understanding of and be able to select and use manufacturing technologies. – The student will be able to:
	19.01 Classify manufactured goods as durable and non-durable.
	19.02 Employ the manufacturing process including the designing, development, making, and servicing of products and systems.
	19.03 Describe manufacturing technologies that are used to modify or alter manufactured products.
20.0	Demonstrate an understanding of and be able to select and use construction technologies. – The student will be able to:
	20.01 Research building laws and codes.
	20.02 Identify factors such as style, convenience, cost, climate, and function in the selection of designs for structures.
	20.03 Identify subsystems of a building.
21.0	Demonstrate proper and safe procedures while working with technological tools, apparatus, equipment, systems, and materials. – The student will be able to:
	21.01 Follow laboratory safety rules and procedures.
	21.02 Demonstrate good housekeeping at workstations within a total laboratory.
	21.03 Conduct laboratory activities and equipment operations in a safe manner.
	21.04 Identify tools, machines, materials and equipment and describe their functions.
	21.05 Select appropriate tools, machines, and equipment to accomplish a given task.
	21.06 Demonstrate safe and correct use of tools, machines, and equipment.
	21.07 Identify color-coding safety standards.
	21.08 Explain fire prevention and safety precautions and practices for extinguishing fires.

CTE Standards and Benchmarks	
	21.09 Identify harmful effects/potential dangers of familiar hazardous substances/devices to people and the environment.
22.0	Exhibit positive human relations and leadership skills. – The student will be able to:
	22.01 Perform roles in a student personnel system or in the Florida Technology Student Association (FL-TSA).
	22.02 Work cooperatively with others.
23.0	Discuss individual interests, aptitudes, and opportunities as they relate to a career. – The student will be able to:
	23.01 Identify individual strengths and weaknesses.
	23.02 Discuss individual interests related to a career.
	23.03 List occupations, job requirements, and job opportunities in production technology.
	23.04 List occupational training programs and academic programs at the secondary/postsecondary levels in production technology.
28.0	Identify evolving technologies of production systems. – The student will be able to:
	28.01 List evolving technologies of manufacturing and construction industries.
	28.02 Discuss the evolution of technologies related to manufacturing systems and construction processes.
	28.03 Brainstorm futuristic production systems.
29.0	Perform special skills unique to manufacturing technology. – The student will be able to:
	29.01 Design a product for custom or mass production manufacturing.
	29.02 Plan a mass production system for manufacturing a product.
	29.03 Perform materials forming practices such as casting or molding, and compressing or stretching.
	29.04 Perform materials separating practices such as shearing, chip removing, and other separating processes.
	29.05 Perform materials conditioning practices such as heat treating, physical conditioning, or through chemical reactions.
	29.06 Combine components through mixing, coating, bonding, and mechanical fastening.
	29.07 Assemble a product or a subassembly of a product.
30.0	Express knowledge of factors that impact manufacturing technology and practices. – The student will be able to:
	30.01 Explain economic factors that impact on manufacturing technology.

CTE Standards and Benchmarks	
	30.02 Research and identify consumer demands for a manufactured product.
	30.03 Identify sources of raw materials and/or standard stock materials needed for a manufactured product.
	30.04 Interview, hire, train, or promote an applicant or employee for a simulated mass production manufacturing activity.
	30.05 Define the terms "organized labor" and "collective bargaining."
	30.06 Prepare a plan for marketing and distributing a manufactured product.
31.0	Perform special skills unique to construction technology. – The student will be able to:
	31.01 Interpret construction plans and blueprints.
	31.02 Identify construction materials.
	31.03 Apply carpentry skills.
	31.04 Apply plumbing skills.
	31.05 Apply electrical wiring skills.
	31.06 Apply masonry skills.
	31.07 Describe or demonstrate basic construction skills.
32.0	Express knowledge of factors that impact construction technology and practices. – The student will be able to:
	32.01 Explain economic factors that impact on construction technology.
	32.02 Research and identify types and styles of construction desired by consumers.
	32.03 List sources of raw materials and standard stock materials available to construction technology.
	32.04 Express knowledge of construction technology labor organizations and hiring practices.

Florida Department of Education
Student Performance Standards

Course Title: **Exploration of Aerospace Technology**
Course Number: **8600050**
Course Length: **Semester**
Teacher Certification: **TEC ED 1 @2** **ENG TEC 7G**
ENG @7 7G **AEROSPACE 7G**

Course Description:
The purpose of this course is to give students an opportunity to explore the area of aerospace technology and its associated careers. Students will be given the opportunity to solve technological problems using a variety of tools, materials, processes and systems while gaining an understanding of the effects of aerospace technology on our everyday lives.

CTE Standards and Benchmarks	
01.0	Demonstrate an understanding of the characteristics and scope of technology. – The student will be able to:
01.01	Develop new products and systems to solve problems or to help do things that could not be done without the help of technology.
01.02	Explain how technology is closely linked with creativity, which has resulted in innovation.
02.0	Demonstrate an understanding of the core concepts of technology. – The student will be able to:
02.01	Describe technological systems including input, processes, output, and, at times, feedback.
02.02	Explain how technological systems can be connected to one another.
02.03	Compare and contrast requirements or parameters placed on the development of a product or system.
02.04	Describe different technologies that involve different sets of processes.
03.0	Demonstrate an understanding of the relationships among technologies and the connection between technology and other fields of study. – The student will be able to:
03.01	Modify the way technological systems interact with one another.
03.02	Apply a product, system, or environment developed for one setting in another setting.
03.03	Explain how knowledge gained from other fields of study has a direct effect on the development of technological products and systems.
04.0	Demonstrate an understanding of the cultural, social, economic, and political effects of technology. – The student will be able to:
04.01	Describe the ways that use of technology affects humans, including their safety, comfort, choices, and attitudes about technology's development and use.

CTE Standards and Benchmarks	
	04.02 Explain that technology, by itself, is neither good nor bad; but decisions about the use of products and systems can result in desirable or undesirable consequences.
	04.03 Describe the economic, political, and cultural issues that are influenced by the development and use of technology.
05.0	Demonstrate an understanding of the effects of technology on the environment. – The student will be able to:
	05.01 Describe the management of waste produced by technological systems as an important societal issue.
	05.02 Describe how technologies can be used to repair damage and to break down waste from the use of various products and systems.
	05.03 Make decisions about the development and use of technologies that put environmental and economic concerns in direct competition with one another.
06.0	Demonstrate an understanding of the role of society in the development and use of technology. – The student will be able to:
	06.01 Describe the development of technologies that has resulted from the demands, values, and interests of individuals, businesses, industries, and societies.
	06.02 Describe changes in society and the creation of new needs and wants caused by the use of inventions and innovations.
	06.03 Explain how meeting societal expectations is the driving force behind the acceptance and use of products and systems.
07.0	Demonstrate an understanding of the influence of technology on history. – The student will be able to:
	07.01 Describe inventions and innovations that have evolved by using slow and methodical processes of tests and refinements.
	07.02 Describe the design and construction of structures for service or convenience evolving from the development of techniques for measurement, controlling systems, and the understanding of spatial relationships.
	07.03 Explain that in the past, an invention or innovation was not usually developed with the knowledge of science.
08.0	Demonstrate an understanding of the attributes of design. – The student will be able to:
	08.01 Use design as a creative planning process that leads to useful products and systems.
	08.02 Explain why there is no perfect design.
	08.03 Evaluate criteria and constraints that are requirements for a design.
09.0	Demonstrate an understanding of engineering design. – The student will be able to:
	09.01 Utilize the design process involving a set of steps, which can be performed in different sequences and repeated as needed.
	09.02 Employ brainstorming as a group problem-solving design process in which each person in the group presents his or her ideas in an open forum.
	09.03 Model, test, evaluate and modify designs to transform ideas into practical solutions.

CTE Standards and Benchmarks	
10.0	Demonstrate an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving. – The student will be able to:
10.01	Use troubleshooting as a problem-solving method used to identify the cause of a malfunction in a technological system.
10.02	Describe invention as a process of turning ideas and imagination into devices and systems and innovation as the process of modifying an existing product or system to improve it.
10.03	Identify technological problems that are best solved through experimentation.
11.0	Demonstrate the abilities to apply the design process. – The student will be able to:
11.01	Apply a design process to solve problems in and beyond the laboratory-classroom.
11.02	Specify criteria and constraints for the design.
11.03	Make two-dimensional and three-dimensional representations of the designed solution.
11.04	Test and evaluate the design in relation to pre-established requirements, such as criteria and constraints, and refine as needed.
11.05	Make a product or system and document the solution.
12.0	Demonstrate the abilities to use and maintain technological products and systems. – The student will be able to:
12.01	Use information provided in manuals, protocols, or by experienced people to see and understand how things work.
12.02	Use tools, materials, and machines safely to diagnose, adjust, and repair systems.
12.03	Use computers and calculators in various applications.
12.04	Operate and maintain systems in order to achieve a given purpose.
13.0	Demonstrate the abilities to assess the impact of products and systems. – The student will be able to:
13.01	Design and use instruments to gather data.
13.02	Use data collected to analyze and interpret trends in order to identify the positive or negative effects of a technology.
13.03	Identify trends and monitor potential consequences of technological development.
13.04	Interpret and evaluate the accuracy of the information obtained and determine if it is useful.
16.0	Demonstrate an understanding of and be able to select and use energy and power technologies. – The student will be able to:
16.01	Define power as the rate at which energy is converted from one form to another or transferred from one place to another, or the rate at which work is done.

CTE Standards and Benchmarks	
	16.02 Describe power systems used to drive and provide propulsion to other technological products and systems.
	16.03 Explain how much of the energy used in our environment is not used efficiently.
17.0	Demonstrate an understanding of and be able to select and use information and communication technologies. – The student will be able to:
	17.01 Create information and communication systems that allow information to be transferred from human to human, human to machine, machine to machine, and machine to human.
	17.02 Describe communication systems made up of a source, encoder, transmitter, receiver, decoder, and destination.
	17.03 Consider factors that influence the design of a message, such as the intended audience, medium, purpose, and nature of the message.
	17.04 Use symbols, measurements, and drawings to promote clear communication by providing a common language to express ideas.
18.0	Demonstrate an understanding of and be able to select and use transportation technologies. – The student will be able to:
	18.01 Describe subsystems of transportation vehicles, such as structural, propulsion, suspension, guidance, control, and support that must function together for a system to work effectively.
	18.02 Employ processes, such as receiving, holding, storing, loading, moving, unloading, delivering, evaluating, marketing, managing, communicating, and using conventions that are necessary for the entire transportation system to operate efficiently.
21.0	Demonstrate proper and safe procedures while working with technological tools, apparatus, equipment, systems, and materials. – The student will be able to:
	21.01 Follow laboratory safety rules and procedures.
	21.02 Demonstrate good housekeeping at workstations within a total laboratory.
	21.03 Conduct laboratory activities and equipment operations in a safe manner.
	21.04 Identify tools, machines, materials and equipment and describe their functions.
	21.05 Select appropriate tools, machines, and equipment to accomplish a given task.
	21.06 Demonstrate safe and correct use of tools, machines, and equipment.
	21.07 Identify color-coding safety standards.
	21.08 Explain fire prevention and safety precautions and practices for extinguishing fires.
	21.09 Identify harmful effects/potential dangers of familiar hazardous substances/devices to people and the environment.
22.0	Exhibit positive human relations and leadership skills. – The student will be able to:
	22.01 Perform roles in a student personnel system or in the Florida Technology Student Association (FL-TSA).

CTE Standards and Benchmarks	
	22.02 Work cooperatively with others.
23.0	Discuss individual interests, aptitudes, and opportunities as they relate to a career. – The student will be able to:
	23.01 Identify individual strengths and weaknesses.
	23.02 Discuss individual interests related to a career.
	23.03 Identify careers within specific areas of technology.
	23.04 Explore careers within specific areas of interest.
	23.05 Form an understanding and appreciation for work after listening to or observing technology workers.
	23.06 Form an understanding and appreciation for work after participating in a simulated technology group project in the laboratory.
	23.07 Form an understanding and appreciation for the roles and work of co-workers.
	23.08 List occupations, job requirements, and job opportunities in communications technology.
	23.09 List occupational training programs and academic programs at the secondary/postsecondary levels in communications technology.
33.0	Demonstrate knowledge of the basic principles of aerostatics and aerodynamics. – The student will be able to:
	33.01 Define terminology associated with aerostatics and aerodynamics.
	33.02 Explain how buoyancy principles affect an object in a fluid.
	33.03 Explain how Bernoulli's Principle applies to an object in flight.
	33.04 Identify and describe basic forces acting on an object in flight.
	33.05 Build an aerostatic vehicle.
	33.06 Build an aerodynamic vehicle.
34.0	Identify and demonstrate knowledge of both liquid and solid propellant rocket propulsion systems. – The student will be able to:
	34.01 Define technical terminology associated with propulsion systems.
	34.02 Identify parts of a solid-propellant rocket engine.
	34.03 Identify parts of a liquid-propellant rocket engine.
	34.04 Discuss the principle of rocket propulsion.

CTE Standards and Benchmarks	
	34.05 Compare the propulsion systems of solid and liquid-propellant rockets.
	34.06 Describe the steps in a multi-stage rocket launch.
	34.07 Construct a solid-propellant model rocket.
35.0	Define and describe the stages and forms of interference in basic satellite communications systems. – The student will be able to:
	35.01 State definitions of the terms communication and interference.
	35.02 List and define the stages of a basic communications system.
	35.03 Describe forms of interference that can occur at various stages in a basic communication system.
	35.04 Discuss the importance of feedback in a basic communications system.
	35.05 Define parts of the process in a basic communications system.
	35.06 Describe the parts of the process in a satellite communications system.
	35.07 Describe the parts of the process in a helium-neon laser communications system.

Florida Department of Education
Student Performance Standards

Course Title: Exploration of Transportation Technology
Course Number: 8600240
Course Length: Semester
Teacher Certification:

TEC ED 1 @2	ENG @7 7G	AUTO MECH @7 7G
DIESEL MEC @7 7G	GASENG RPR @7 7G	AUTO IND @7 %7G
TRANSPORT @4 @7 7G	AIR MECH @7 7G	TECH MECH %7G

Course Description:
The purpose of this course is to give students an opportunity to explore the area of transportation technology and its associated careers. Students will be given the opportunity to solve technological problems using a variety of tools, materials, processes and systems while gaining an understanding of the effects of transportation technology on our everyday lives.

CTE Standards and Benchmarks	
01.0	Demonstrate an understanding of the characteristics and scope of technology. – The student will be able to:
01.01	Develop new products and systems to solve problems or to help do things that could not be done without the help of technology.
01.02	Describe the development of technology as a human activity that is the result of individual or collective needs and the ability to be creative.
02.0	Demonstrate an understanding of the core concepts of technology. – The student will be able to:
02.01	Apply systems thinking, involving considering how every part relates to others.
02.02	Identify control systems having no feedback path and requiring human intervention, and control systems using feedback.
02.03	Explain how technological systems can be connected to one another.
02.04	Compare and contrast requirements or parameters placed on the development of a product or system.
02.05	Compare and contrast trade-offs as a decision process recognizing the need for careful compromises among competing factors.
02.06	Perform basic maintenance as the process of inspecting and servicing a product or system on a regular basis in order for it to continue functioning properly, to extend its life, or to upgrade its capability.
02.07	Identify controls and mechanisms or particular steps that people perform using information about the system that causes systems to change.
03.0	Demonstrate an understanding of the relationships among technologies and the connection between technology and other fields of study. – The student will be able to:
03.01	Modify the way technological systems interact with one another.

CTE Standards and Benchmarks	
	03.02 Apply a product, system, or environment developed for one setting in another setting.
	03.03 Explain how knowledge gained from other fields of study has a direct effect on the development of technological products and systems.
04.0	Demonstrate an understanding of the cultural, social, economic, and political effects of technology. – The student will be able to:
	04.01 Describe the ways that use of technology affects humans, including their safety, comfort, choices, and attitudes about technology's development and use.
	04.02 Explain that technology, by itself, is neither good nor bad; but decisions about the use of products and systems can result in desirable or undesirable consequences.
	04.03 Describe the economic, political, and cultural issues that are influenced by the development and use of technology.
05.0	Demonstrate an understanding of the effects of technology on the environment. – The student will be able to:
	05.01 Describe the management of waste produced by technological systems as an important societal issue.
	05.02 Describe how technologies can be used to repair damage caused by natural disasters and to break down waste from the use of various products and systems.
	05.03 Make decisions about the development and use of technologies that put environmental and economic concerns in direct competition with one another.
06.0	Demonstrate an understanding of the role of society in the development and use of technology. – The student will be able to:
	06.01 Describe the development of technologies that has resulted from the demands, values, and interests of individuals, businesses, industries, and societies.
	06.02 Describe changes in society and the creation of new needs and wants caused by the use of inventions and innovations.
	06.03 Explain how meeting societal expectations is the driving force behind the acceptance and use of products and systems.
07.0	Demonstrate an understanding of the influence of technology on history. – The student will be able to:
	07.01 Describe inventions and innovations that have evolved by using slow and methodical processes of tests and refinements.
	07.02 Describe the design and construction of structures for service or convenience evolving from the development of techniques for measurement, controlling systems, and the understanding of spatial relationships.
	07.03 Explain that in the past, an invention or innovation was not usually developed with the knowledge of science.
08.0	Demonstrate an understanding of the attributes of design. – The student will be able to:
	08.01 Use design as a creative planning process that leads to useful products and systems.
	08.02 Explain why there is no perfect design.
	08.03 Evaluate criteria and constraints that are requirements for a design.

CTE Standards and Benchmarks	
09.0	Demonstrate an understanding of engineering design. – The student will be able to:
09.01	Utilize the design process involving a set of steps, which can be performed in different sequences and repeated as needed.
09.02	Employ brainstorming as a group problem-solving design process in which each person in the group presents his or her ideas in an open forum.
09.03	Model, test, evaluate and modify designs to transform ideas into practical solutions.
10.0	Demonstrate an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving. – The student will be able to:
10.01	Use troubleshooting as a problem-solving method used to identify the cause of a malfunction in a technological system.
10.02	Describe invention as a process of turning ideas and imagination into devices and systems and innovation as the process of modifying an existing product or system to improve it.
10.03	Identify technological problems that are best solved through experimentation.
11.0	Demonstrate the abilities to apply the design process. – The student will be able to:
11.01	Apply a design process to solve problems in and beyond the laboratory-classroom.
11.02	Specify criteria and constraints for the design.
11.03	Make two-dimensional and three-dimensional representations of the designed solution.
11.04	Test and evaluate the design in relation to pre-established requirements, such as criteria and constraints, and refine as needed.
11.05	Make a product or system and document the solution.
12.0	Demonstrate the abilities to use and maintain technological products and systems. – The student will be able to:
12.01	Use information provided in manuals, protocols, or by experienced people to see and understand how things work.
12.02	Use tools, materials, and machines safely to diagnose, adjust, and repair systems.
12.03	Use computers and calculators in various applications.
12.04	Operate and maintain systems in order to achieve a given purpose.
13.0	Demonstrate the abilities to assess the impact of products and systems. – The student will be able to:
13.01	Design and use instruments to gather data.
13.02	Use data collected to analyze and interpret trends in order to identify the positive or negative effects of a technology.

CTE Standards and Benchmarks	
	13.03 Identify trends and monitor potential consequences of technological development.
	13.04 Interpret and evaluate the accuracy of the information obtained and determine if it is useful.
16.0	Demonstrate an understanding of and be able to select and use energy and power technologies. – The student will be able to:
	16.01 Describe power systems used to drive and provide propulsion to other technological products and systems.
	16.02 Explain how much of the energy used in our environment is not used efficiently.
18.0	Demonstrate an understanding of and be able to select and use transportation technologies. – The student will be able to:
	18.01 Describe how transporting people and goods involve a combination of individuals and vehicles.
	18.02 Describe subsystems of transportation vehicles, such as structural, propulsion, suspension, guidance, control, and support that must function together for a system to work effectively.
	18.03 Identify governmental regulations that influence the design and operation of transportation systems.
	18.04 Employ processes, such as receiving, holding, storing, loading, moving, unloading, delivering, evaluating, marketing, managing, communicating, and using conventions that are necessary for the entire transportation system to operate efficiently.
21.0	Demonstrate proper and safe procedures while working with technological tools, apparatus, equipment, systems, and materials. – The student will be able to:
	21.01 Follow laboratory safety rules and procedures.
	21.02 Demonstrate good housekeeping at workstations within a total laboratory.
	21.03 Conduct laboratory activities and equipment operations in a safe manner.
	21.04 Identify tools, machines, materials and equipment and describe their functions.
	21.05 Select appropriate tools, machines, and equipment to accomplish a given task.
	21.06 Demonstrate safe and correct use of tools, machines, and equipment.
	21.07 Identify color-coding safety standards.
	21.08 Explain fire prevention and safety precautions and practices for extinguishing fires.
	21.09 Identify harmful effects/potential dangers of familiar hazardous substances/devices to people and the environment.
22.0	Exhibit positive human relations and leadership skills. – The student will be able to:
	22.01 Perform roles in a student personnel system or in the Florida Technology Student Association (FL-TSA).
	22.02 Work cooperatively with others.

CTE Standards and Benchmarks	
23.0	Discuss individual interests and aptitudes as they relate to a career. – The student will be able to:
23.01	Identify individual strengths and weaknesses.
23.02	Discuss individual interests related to a career.
23.03	Identify careers within specific areas of technology.
23.04	Explore careers within specific areas of interest.
23.05	Form an understanding and appreciation for work after listening to or observing technology workers.
23.06	Form an understanding and appreciation for work after participating in a simulated technology group project in the laboratory.
23.07	Form an understanding and appreciation for the roles and work of co-workers.
23.08	List occupations, job requirements, and job opportunities in production technology.
23.09	List occupational training programs and academic programs at the secondary/postsecondary levels in production technology.
36.0	Perform special skills unique to transportation technologies. – The student will be able to:
36.01	Disassemble and reassemble or perform maintenance on a muscle-powered bicycle.
36.02	Disassemble and reassemble or perform maintenance on a pneumatic or hydraulic device.
36.03	Disassemble and reassemble or perform maintenance on an internal combustion engine.
36.04	Disassemble and reassemble or perform maintenance on an electrical motor, generator, or alternator.
36.05	Construct, maintain, or repair a land, water, or air/space vehicle.
37.0	Express knowledge of the industries that deal with transportation technology. – The student will be able to:
37.01	Describe power and energy applications in transportation technology.
37.02	Identify transportation products that have been developed by industries.
37.03	List and describe transportation systems produced or used by industries.

Florida Department of Education
Student Performance Standards

Course Title: Exploration of Power and Energy Technology
Course Number: 8600250
Course Length: Semester
Teacher Certification: TEC ED 1 @2, TRANSPORT @4 @7 7G, AUTO MECH @7 7G, GASENG RPR @7 7G, DIESEL MECH @7 7G, ENG @7 7G, TEC MECH %7G, AUTO IND @7 %7G

Course Description:
The purpose of this course is to give students an opportunity to explore the area of power and energy technology and its associated careers. Students will be given the opportunity to solve technological problems using a variety of tools, materials, processes and systems while gaining an understanding of the effects of power and energy technology on our everyday lives.

CTE Standards and Benchmarks	
01.0	Demonstrate an understanding of the characteristics and scope of technology. – The student will be able to:
01.01	Develop new products and systems to solve problems or to help do things that could not be done without the help of technology.
01.02	Describe the development of technology as a human activity that is the result of individual or collective needs and the ability to be creative.
02.0	Demonstrate an understanding of the core concepts of technology. – The student will be able to:
02.01	Explain how technological systems can be connected to one another.
02.02	Compare and contrast trade-offs as a decision process recognizing the need for careful compromises among competing factors.
02.03	Perform basic maintenance as the process of inspecting and servicing a product or system on a regular basis in order for it to continue functioning properly, to extend its life, or to upgrade its capability.
02.04	Utilize controls and mechanisms or particular steps that people perform using information about the system that causes systems to change.
03.0	Demonstrate an understanding of the relationships among technologies and the connection between technology and other fields of study. – The student will be able to:
03.01	Modify the way technological systems interact with one another.
03.02	Apply a product, system, or environment developed for one setting in another setting.
03.03	Explain how knowledge gained from other fields of study has a direct effect on the development of technological products and systems.

CTE Standards and Benchmarks	
04.0	Demonstrate an understanding of the cultural, social, economic, and political effects of technology. – The student will be able to:
04.01	Describe the ways that use of technology affects humans, including their safety, comfort, choices, and attitudes about technology's development and use.
04.02	Explain that technology, by itself, is neither good nor bad; but decisions about the use of products and systems can result in desirable or undesirable consequences.
04.03	Describe the economic, political, and cultural issues that are influenced by the development and use of technology.
05.0	Demonstrate an understanding of the effects of technology on the environment. – The student will be able to:
05.01	Describe the management of waste produced by technological systems as an important societal issue.
05.02	Describe how technologies can be used to repair damage and to break down waste from the use of various products and systems.
05.03	Make decisions about the development and use of technologies that put environmental and economic concerns in direct competition with one another.
06.0	Demonstrate an understanding of the role of society in the development and use of technology. – The student will be able to:
06.01	Describe the development of technologies that has resulted from the demands, values, and interests of individuals, businesses, industries, and societies.
06.02	Describe changes in society and the creation of new needs and wants caused by the use of inventions and innovations.
06.03	Explain how meeting societal expectations is the driving force behind the acceptance and use of products and systems.
07.0	Demonstrate an understanding of the influence of technology on history. – The student will be able to:
07.01	Describe inventions and innovations that have evolved by using slow and methodical processes of tests and refinements.
07.02	Explain how the specialization of function has been at the heart of many technological improvements.
07.03	Explain that in the past, an invention or innovation was not usually developed with the knowledge of science.
08.0	Demonstrate an understanding of the attributes of design. – The student will be able to:
08.01	Use design as a creative planning process that leads to useful products and systems.
08.02	Explain why there is no perfect design.
08.03	Evaluate criteria and constraints that are requirements for a design.
09.0	Demonstrate an understanding of engineering design. – The student will be able to:
09.01	Utilize the design process involving a set of steps, which can be performed in different sequences and repeated as needed.

CTE Standards and Benchmarks	
	09.02 Employ brainstorming as a group problem-solving design process in which each person in the group presents his or her ideas in an open forum.
	09.03 Model, test, evaluate and modify designs to transform ideas into practical solutions.
10.0	Demonstrate an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving. – The student will be able to:
	10.01 Use troubleshooting as a problem-solving method used to identify the cause of a malfunction in a technological system.
	10.02 Describe invention as a process of turning ideas and imagination into devices and systems and innovation as the process of modifying an existing product or system to improve it.
	10.03 Identify technological problems that are best solved through experimentation.
11.0	Demonstrate the abilities to apply the design process. – The student will be able to:
	11.01 Apply a design process to solve problems in and beyond the laboratory-classroom.
	11.02 Specify criteria and constraints for the design.
	11.03 Make two-dimensional and three-dimensional representations of the designed solution.
	11.04 Test and evaluate the design in relation to pre-established requirements, such as criteria and constraints, and refine as needed.
	11.05 Make a product or system and document the solution.
12.0	Demonstrate the abilities to use and maintain technological products and systems. – The student will be able to:
	12.01 Use information provided in manuals, protocols, or by experienced people to see and understand how things work.
	12.02 Use tools, materials, and machines safely to diagnose, adjust, and repair systems.
	12.03 Use computers and calculators in various applications.
	12.04 Operate and maintain systems in order to achieve a given purpose.
13.0	Demonstrate the abilities to assess the impact of products and systems. – The student will be able to:
	13.01 Design and use instruments to gather data.
	13.02 Use data collected to analyze and interpret trends in order to identify the positive or negative effects of a technology.
	13.03 Identify trends and monitor potential consequences of technological development.
	13.04 Interpret and evaluate the accuracy of the information obtained and determine if it is useful.

CTE Standards and Benchmarks	
16.0	Demonstrate an understanding of and be able to select and use energy and power technologies. – The student will be able to:
16.01	Define energy as the capacity to do work.
16.02	Explain how energy can be used to do work, using many processes.
16.03	Define power as the rate at which energy is converted from one form to another or transferred from one place to another, or the rate at which work is done.
16.04	Describe power systems used to drive and provide propulsion to other technological products and systems.
16.05	Explain how much of the energy used in our environment is not used efficiently.
17.0	Demonstrate an understanding of and be able to select and use information and communication technologies. – The student will be able to:
17.01	Create information and communication systems that allow information to be transferred from human to human, human to machine, machine to machine, and machine to human.
17.02	Use symbols, measurements, and drawings to promote clear communication by providing a common language to express ideas.
21.0	Demonstrate proper and safe procedures while working with technological tools, apparatus, equipment, systems, and materials. – The student will be able to:
21.01	Follow laboratory safety rules and procedures.
21.02	Demonstrate good housekeeping at workstation within total laboratory.
21.03	Conduct laboratory activities and equipment operations in a safe manner.
21.04	Identify tools, machines, materials and equipment and describe their functions.
21.05	Select appropriate tools, machines, and equipment to accomplish a given task.
21.06	Demonstrate safe and correct use of tools, machines, and equipment.
21.07	Identify color-coding safety standards.
21.08	Explain fire prevention and safety precautions and practices for extinguishing fires.
21.09	Identify harmful effects/potential dangers of familiar hazardous substances/devices to people and the environment.
22.0	Exhibit positive human relations and leadership skills. – The student will be able to:
22.01	Perform roles in a student personnel system or in the Florida Technology Student Association (FL-TSA).
22.02	Work cooperatively with others.

CTE Standards and Benchmarks	
23.0	Discuss individual interests, aptitudes, and opportunities as they relate to a career. – The student will be able to:
23.01	Identify individual strengths and weaknesses.
23.02	Discuss individual interests related to a career.
23.03	Identify careers within specific areas of technology.
23.04	Explore careers within specific areas of interest.
23.05	Form an understanding and appreciation for work after listening to or observing technology workers.
23.06	Form an understanding and appreciation for work after participating in a simulated technology group project in the laboratory.
23.07	Form an understanding and appreciation for the roles and work of co-workers.
23.08	List occupations, job requirements, and employment opportunities in power energy technology.
23.09	List occupational training programs and academic programs available at the secondary and postsecondary levels in power and energy technologies.
38.0	Perform special skills unique to power and energy technologies. – The student will be able to:
38.01	Disassemble and reassemble or perform maintenance on a human-powered device.
38.02	Disassemble and reassemble or perform maintenance on a pneumatic or hydraulic device.
38.03	Disassemble and reassemble or perform maintenance on an internal combustion engine.
38.04	Disassemble and reassemble or perform maintenance on an electrical motor, generator, or alternator.
38.05	Construct a water-powered, wind-powered, steam-powered, thermal-powered, or solar-powered device.
39.0	Express knowledge of the industries that deal with power and energy technology. – The student will be able to:
39.01	Identify the technologies that supply or control energy sources.
39.02	Identify technologies that produce power systems.
39.03	Describe power and energy applications in everyday life.
39.04	List energy systems produced or used by industries.

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.

Special Notes

The length of this course is one semester. It may be offered for two semesters when appropriate. When offered for one semester, it is recommended that it be at the exploratory level and more in-depth when offered for two semesters.

Career and Technical Student Organization (CTSO)

The Florida Technology Student Association (FL-TSA) is the intercurricular career and technical student organization for providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

Accommodations

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

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

Florida Department of Education
Curriculum Framework

Course Title: **Exploration of Production Technology and Career Planning**
Course Type: **Orientation/Exploratory and Career Planning**
Career Cluster: **Engineering & Technology Education**

Secondary – Middle School	
Course Number	8600042
CIP Number	08210122CE
Grade Level	6 - 8
Standard Length	Semester
Teacher Certification	WOODWORKIN @4 ENG @7 7G TEC ED 1 @2 CARPENTRY @7 7G TEC CONSTR @7 7G BLDG MAINT @7 7G BLDG CONST @7 7G
CTSO	Florida Technology Student Association (FL-TSA)
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

The purpose of this course is to give students an opportunity to explore the area of production technology and its associated careers. Course requirements are consistent with 8600040 Exploration of Production Technology with the addition of the career and education planning course requirements. Students will be given the opportunity to solve technological problems using a variety of tools, materials, processes and systems while gaining an understanding of the effects of production technology on our everyday lives.

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

Program Structure

The lengths of these courses are one semester. The same course may be offered for two semesters when appropriate. When offered for one semester, it is recommended that it be at the exploratory level and more in-depth when offered for two semesters.

Standards

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

01.0 Demonstrate an understanding of the characteristics and scope of technology.
02.0 Demonstrate an understanding of the core concepts of technology.
03.0 Demonstrate an understanding of the relationships among technologies and the connection between technology and other fields of study.
04.0 Demonstrate an understanding of the cultural, social, economic, and political effects of technology.
05.0 Demonstrate an understanding of the effects of technology on the environment.
06.0 Demonstrate an understanding of the role of society in the development and use of technology.
07.0 Demonstrate an understanding of the influence of history on technology.
08.0 Demonstrate an understanding of the attributes of design.
09.0 Demonstrate an understanding of engineering design.
10.0 Demonstrate an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving.
11.0 Demonstrate the abilities to apply the design process.
12.0 Demonstrate the abilities to use and maintain technological products and systems.
13.0 Demonstrate the abilities to assess the impact of products and systems.
14.0 Demonstrate an understanding of and be able to select and use manufacturing technologies.
15.0 Demonstrate an understanding of and be able to select and use construction technologies.
16.0 Demonstrate proper and safe procedures while working with technological tools, apparatus, equipment, systems, and materials.
17.0 Exhibit positive human relations and leadership skills.
18.0 Discuss individual interests, aptitudes, and opportunities as they relate to a career.
19.0 Identify evolving technologies of production systems.
20.0 Perform special skills unique to manufacturing technology.
21.0 Express knowledge of factors that impact manufacturing technology and practices.
22.0 Perform special skills unique to construction technology.
23.0 Express knowledge of factors that impact construction technology and practices.

Listed below are the standards that must be met to satisfy the requirements of Section 1003.4156, Florida Statutes

24.0 Describe the influences that societal, economic, and technological changes have on employment trends and future training.
25.0 Develop skills to locate, evaluate, and interpret career information.
26.0 Identify and demonstrate processes for making short and long term goals.
27.0 Demonstrate employability skills such as working in a group, problem-solving and organizational skills, and the importance of entrepreneurship.
28.0 Understand the relationship between educational achievement and career choices/postsecondary options.
29.0 Identify a career cluster and related pathways through an interest assessment that match career and education goals.
30.0 Develop a career and education plan that includes short and long-term goals, high school program of study, and postsecondary/career goals.
31.0 Demonstrate knowledge of technology and its application in career fields/clusters.

Florida Department of Education
Student Performance Standards

Course Title: **Exploration of Production Technology and Career Planning**
Course Number: **8600042**
Course Length: **Semester**

CTE Standards and Benchmarks	
01.0	Demonstrate an understanding of the characteristics and scope of technology. – The student will be able to:
01.01	Develop new products and systems to solve problems or to help do things that could not be done without the help of technology.
01.02	Describe the development of technology as a human activity that is the result of individual or collective needs and the ability to be creative.
01.03	Explain how technology is closely linked with creativity, which has resulted in innovation.
01.04	Demonstrate how corporations can often create demand for a product by bringing it onto the market and advertising it.
02.0	Demonstrate an understanding of the core concepts of technology. – The student will be able to:
02.01	Describe technological systems including input, processes, output, and, at times, feedback.
02.02	Apply systems thinking, involving considering how every part relates to others.
02.03	Identify control systems having no feedback path and requiring human intervention, and control system using feedback.
02.04	Explain how technological systems can be connected to one another.
02.05	Repair malfunctions of any part of a system that may affect the function and quality of the system.
02.06	Compare and contrast requirements or parameters placed on the development of a product or system.
02.07	Compare and contrast trade-offs as a decision process recognizing the need for careful compromises among competing factors.
02.08	Perform basic maintenance as the process of inspecting and servicing a product or system on a regular basis in order for it to continue functioning properly, to extend its life, or to upgrade its capability.
02.09	Utilize controls and mechanisms or particular steps that people perform using information about the system that causes systems to change.
03.0	Demonstrate an understanding of the relationships among technologies and the connection between technology and other fields of study. – The student will be able to:
03.01	Modify the way technological systems interact with one another.

CTE Standards and Benchmarks	
	03.02 Explain how knowledge gained from other fields of study has a direct effect on the development of technological products and systems.
04.0	Demonstrate an understanding of the cultural, social, economic, and political effects of technology. – The student will be able to:
	04.01 Describe the ways that use of technology affects humans, including their safety, comfort, choices, and attitudes about technology's development and use.
	04.02 Explain that technology, by itself, is neither good nor bad, but decisions about the use of products and systems can result in desirable or undesirable consequences.
	04.03 Describe ethical issues associated with the development and use of technology.
	04.04 Describe the economic, political, and cultural issues that are influenced by the development and use of technology.
05.0	Demonstrate an understanding of the effects of technology on the environment. – The student will be able to:
	05.01 Describe the management of waste produced by technological systems as an important societal issue.
	05.02 Describe how technologies can be used to repair damage caused by natural disasters and to break down waste from the use of various products and systems.
	05.03 Make decisions about the development and use of technologies that put environmental and economic concerns in direct competition with one another.
06.0	Demonstrate an understanding of the role of society in the development and use of technology. – The student will be able to:
	06.01 Describe the development of technologies that has resulted from the demands, values, and interests of individuals, businesses, industries, and societies.
	06.02 Describe changes in society and the creation of new needs and wants caused by the use of inventions and innovations.
	06.03 Describe social and cultural priorities and values that are reflected in technological devices.
	06.04 Explain how meeting societal expectations is the driving force behind the acceptance and use of products and systems.
07.0	Demonstrate an understanding of the influence of history on technology. – The student will be able to:
	07.01 Describe inventions and innovations that have evolved by using slow and methodical processes of tests and refinements.
	07.02 Explain how the specialization of function has been at the heart of many technological improvements.
	07.03 Explain that in the past, an invention or innovation was not usually developed with the knowledge of science.
08.0	Demonstrate an understanding of the attributes of design. – The student will be able to:
	08.01 Use design as a creative planning process that leads to useful products and systems.
	08.02 Explain why there is no perfect design.

CTE Standards and Benchmarks	
	08.03 Evaluate criteria and constraints that are requirements for a design.
09.0	Demonstrate an understanding of engineering design. – The student will be able to:
	09.01 Utilize the design process involving a set of steps, which can be performed in different sequences and repeated as needed.
	09.02 Employ brainstorming as a group problem-solving design process in which each person in the group presents his or her ideas in an open forum.
	09.03 Model, test, evaluate and modify designs to transform ideas into practical solutions.
10.0	Demonstrate an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving. – The student will be able to:
	10.01 Use troubleshooting as a problem-solving method used to identify the cause of a malfunction in a technological system.
	10.02 Describe invention as a process of turning ideas and imagination into devices and systems and innovation as the process of modifying an existing product or system to improve it.
	10.03 Identify technological problems that are best solved through experimentation.
11.0	Demonstrate the abilities to apply the design process. – The student will be able to:
	11.01 Apply a design process to solve problems in and beyond the laboratory-classroom.
	11.02 Specify criteria and constraints for the design.
	11.03 Make two-dimensional and three-dimensional representations of the designed solution.
	11.04 Test and evaluate the design in relation to pre-established requirements, such as criteria and constraints, and refine as needed.
	11.05 Make a product or system and document the solution.
12.0	Demonstrate the abilities to use and maintain technological products and systems. – The student will be able to:
	12.01 Use information provided in manuals, protocols, or by experienced people to see and understand how things work.
	12.02 Use tools, materials, and machines safely to diagnose, adjust, and repair systems.
	12.03 Use computers and calculators in various applications.
	12.04 Operate and maintain systems in order to achieve a given purpose.
13.0	Demonstrate the abilities to assess the impact of products and systems. – The student will be able to:
	13.01 Design and use instruments to gather data.

CTE Standards and Benchmarks	
	13.02 Use data collected to analyze and interpret trends in order to identify the positive or negative effects of a technology.
	13.03 Identify trends and monitor potential consequences of technological development.
	13.04 Interpret and evaluate the accuracy of the information obtained and determine if it is useful.
14.0	Demonstrate an understanding of and be able to select and use manufacturing technologies. – The student will be able to:
	14.01 Classify manufactured goods as durable and non-durable.
	14.02 Employ the manufacturing process including the designing, development, making, and servicing of products and systems.
	14.03 Describe manufacturing technologies that are used to modify or alter manufactured products.
15.0	Demonstrate an understanding of and be able to select and use construction technologies. – The student will be able to:
	15.01 Research building laws and codes.
	15.02 Identify factors such as style, convenience, cost, climate, and function in the selection of designs for structures.
	15.03 Identify subsystems of a building.
16.0	Demonstrate proper and safe procedures while working with technological tools, apparatus, equipment, systems, and materials. – The student will be able to:
	16.01 Follow laboratory safety rules and procedures.
	16.02 Demonstrate good housekeeping at workstations within a total laboratory.
	16.03 Conduct laboratory activities and equipment operations in a safe manner.
	16.04 Identify tools, machines, materials and equipment and describe their functions.
	16.05 Select appropriate tools, machines, and equipment to accomplish a given task.
	16.06 Demonstrate safe and correct use of tools, machines, and equipment.
	16.07 Identify color-coding safety standards.
	16.08 Explain fire prevention and safety precautions and practices for extinguishing fires.
	16.09 Identify harmful effects/potential dangers of familiar hazardous substances/devices to people and the environment.
17.0	Exhibit positive human relations and leadership skills. – The student will be able to:
	17.01 Perform roles in a student personnel system or in the Florida Technology Student Association (FL-TSA).

CTE Standards and Benchmarks	
	17.02 Work cooperatively with others.
18.0	Discuss individual interests, aptitudes, and opportunities as they relate to a career. – The student will be able to:
	18.01 Identify individual strengths and weaknesses.
	18.02 Discuss individual interests related to a career.
	18.03 List occupations, job requirements, and job opportunities in production technology.
	18.04 List occupational training programs and academic programs at the secondary/postsecondary levels in production technology.
19.0	Identify evolving technologies of production systems. – The student will be able to:
	19.01 List evolving technologies of manufacturing and construction industries.
	19.02 Discuss the evolution of technologies related to manufacturing systems and construction processes.
	19.03 Brainstorm futuristic production systems.
20.0	Perform special skills unique to manufacturing technology--The student will be able to:
	20.01 Design a product for custom or mass production manufacturing.
	20.02 Plan a mass production system for manufacturing a product.
	20.03 Perform materials forming practices such as casting or molding, and compressing or stretching.
	20.04 Perform materials separating practices such as shearing, chip removing, and other separating processes.
	20.05 Perform materials conditioning practices such as heat treating, physical conditioning, or through chemical reactions.
	20.06 Combine components through mixing, coating, bonding, and mechanical fastening.
	20.07 Assemble a product or a subassembly of a product.
21.0	Express knowledge of factors that impact manufacturing technology and practices--The student will be able to:
	21.01 Explain economic factors that impact on manufacturing technology.
	21.02 Research and identify consumer demands for a manufactured product.
	21.03 Identify sources of raw materials and/or standard stock materials needed for a manufactured product.
	21.04 Interview, hire, train, or promote an applicant or employee for a simulated mass production manufacturing activity.

CTE Standards and Benchmarks	
	21.05 Define the terms "organized labor" and "collective bargaining."
	21.06 Prepare a plan for marketing and distributing a manufactured product.
22.0	Perform special skills unique to construction technology--The student will be able to:
	22.01 Interpret construction plans and blueprints.
	22.02 Identify construction materials.
	22.03 Apply carpentry skills.
	22.04 Apply plumbing skills.
	22.05 Apply electrical wiring skills.
	22.06 Apply masonry skills.
	22.07 Describe or demonstrate basic construction skills.
23.0	Express knowledge of factors that impact construction technology and practices--The student will be able to:
	23.01 Explain economic factors that impact on construction technology.
	23.02 Research and identify types and styles of construction desired by consumers.
	23.03 List sources of raw materials and standard stock materials available to construction technology.
	23.04 Express knowledge of construction technology labor organizations and hiring practices.
Listed below are the standards that must be met to satisfy the requirements of Section 1003.4156, Florida Statutes--The student will be able to:	
24.0	Describe the influences that societal, economic, and technological changes have on employment trends and future training.
25.0	Develop skills to locate, evaluate, and interpret career information.
26.0	Identify and demonstrate processes for making short and long term goals.
27.0	Demonstrate employability skills such as working in a group, problem-solving and organizational skills, and the importance of entrepreneurship.
28.0	Understand the relationship between educational achievement and career choices/postsecondary options.
29.0	Identify a career cluster and related pathways through an interest assessment that match career and education goals.

CTE Standards and Benchmarks	
30.0	Develop a career and education plan that includes short and long-term goals, high school program of study, and postsecondary/career goals.
31.0	Demonstrate knowledge of technology and its application in career fields/clusters.

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.

Special Notes

The lengths of these courses are one semester. The same course may be offered for two semesters when appropriate. When offered for one semester, it is recommended that it be at the exploratory level and more in-depth when offered for two semesters.

Career Planning

The requirements of section 1003.4156 (1) (e), Florida Statutes, have been integrated into this course. The statute requires that students take a career and education planning course that must result in a completed personalized academic and career plan for the student; must emphasize the importance of entrepreneurship skills; must emphasize technology or the application of technology in career fields; and, beginning in the 2014-2015 academic year, must provide information from the Department of Economic Opportunity's economic security report as described in section 445.07, Florida Statutes. For additional information on the Middle School Career and Education Planning course requirements, go to http://www.fldoe.org/workforce/ced/.

Career and Technical Student Organization (CTSO)

The Florida Technology Student Association (FL-TSA) is the intercurricular career and technical student organization for providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

Accommodations

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

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

Florida Department of Education
Curriculum Framework

Program Title: **Aerospace Technologies**
Program Type: **Non Career Preparatory**
Career Cluster: **Engineering & Technology Education**

Secondary – Non Career Preparatory	
Program Number	8600080
CIP Number	0821011800
Grade Level	9-12; 30, 31
Standard Length	3 credits
Teacher Certification	TEC ED 1 @2 ENG @7 7G ENG TEC 7G AEROSPACE 7G
CTSO	Florida Technology Student Association (FL-TSA)
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 Aerospace Technologies, its effect upon our lives, and the choosing of an occupation. The content and activities will also include the study of 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.

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 one-credit courses. The following table illustrates the program structure:

Course Number	Course Title	Length	Level	Graduation Requirement
8600580	Aerospace Technologies I	1 credit	2	EQ
8600680	Aerospace Technologies II	1 credit	2	EQ
8601780	Aerospace Technologies III	1 credit	3	EQ

(Graduation Requirement Abbreviations- EQ= Equally Rigorous Science, PA= Practical Arts, EC= Economics, VO= Career and Technical Education)

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.

Academic Alignment Table

Academic alignment is an ongoing, collaborative effort of professional educators specializing in the fields of science, mathematics, English/language arts, and Career and Technical Education (CTE). This initiative supports CTE programs by improving student performance through the integration of academic content within CTE courses. Career and Technical Education courses that have been aligned to the Next Generation Sunshine State Standards for Science and the Florida Standards for Mathematics and English/Language Arts will show the following data: the quantity of academic standards in the CTE course; the total number of standards contained in the academic course; and the percentage of alignment to the CTE course.

Courses	Anatomy/ Physiology Honors	Astronomy Solar/Galactic Honors	Biology 1	Chemistry 1	Earth-Space Science	Environmental Science	Genetics	Integrated Science	Marine Science 1 Honors	Physical Science	Physics 1
8600580	2/87 2%	22/80 28%	13/83 16%	13/69 19%	21/67 31%	13/70 19%	4/69 6%	21/82 26%	18/66 27%	25/74 34%	16/72 22%
8600680	14/87 16%	24/80 30%	15/83 18%	14/69 20%	22/67 33%	14/70 20%	5/69 7%	21/82 26%	18/66 27%	26/74 35%	19/72 26%
8601780	6/87 7%	26/80 33%	10/83 12%	18/69 26%	17/67 25%	18/70 26%	9/69 13%	17/82 21%	22/66 33%	22/74 30%	21/72 29%

** *Alignment pending review* # *Alignment attempted, but no correlation to academic course*

Courses	Algebra 1	Algebra 2	Geometry	English 1	English 2	English 3	English 4
8600580	4/67 6%	4/75 5%	5/54 9%	18/46 39%	18/45 40%	#	#

Courses	Algebra 1	Algebra 2	Geometry	English 1	English 2	English 3	English 4
8600680	4/67 6%	4/75 5%	5/54 9%	18/46 39%	18/45 40%	#	#
8601780	#	7/75 9%	2/54 4%	#	#	20/45 44%	20/45 44%

** *Alignment pending review* # *Alignment attempted, but no correlation to academic course*

Florida Standards for Technical Subjects

Florida Standards (FS) for English Language Arts and Literacy in History/Social Studies, Science, and Technical Subjects are the critical reading and writing literacy standards designed for grade 6 and above. These standards are predicated on teachers of history/social studies, science, and technical subjects using their content area expertise to help students meet the particular challenges of reading, writing, speaking, listening, and language in their respective fields. It is important to note that the 6-12 literacy standards in history/social studies, science, and technical subjects are not meant to replace content standards in those areas but rather to supplement them.

This curriculum framework incorporates the grades 9-10 reading and writing literacy standards in the first two courses of this CTE program and grade 11-12 reading and writing literacy standards in the third and fourth courses of this CTE program. The standards for Mathematical Practices describe varieties of expertise that educators at all levels should seek to develop in their students. These practices rest on important "processes and proficiencies" with longstanding importance in mathematics education. This curriculum framework incorporates the appropriate mathematical practices in the first four courses of this CTE program.

Common Career Technical Core – Career Ready Practices

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

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

2. Apply appropriate academic and technical skills.

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

4. Communicate clearly, effectively and with reason.

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

6. Demonstrate creativity and innovation.

7. Employ valid and reliable research strategies.

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

9. Model integrity, ethical leadership and effective management.

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

11. Use technology to enhance productivity.

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

Standards

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

01.0 Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Aerospace Technologies.
02.0 Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Aerospace Technologies.
03.0 Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Aerospace Technologies.
04.0 Demonstrate an understanding of the characteristics and scope of technology.
05.0 Demonstrate an understanding of the core concepts of technology.
06.0 Demonstrate an understanding of the relationships among technologies and the connection between technology and other fields of study.
07.0 Demonstrate an understanding of the cultural, social, economic, and political effects of technology.
08.0 Demonstrate an understanding of the effects of technology on the environment. .
09.0 Demonstrate an understanding of the role of society in the development and use of technology.
10.0 Demonstrate an understanding of the influence of technology on history.
11.0 Demonstrate an understanding of the attributes of design.
12.0 Demonstrate an understanding of engineering design.
13.0 Demonstrate an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving.
14.0 Demonstrate the abilities to apply the design process.
15.0 Demonstrate the abilities to use and maintain technological products and systems.
16.0 Demonstrate the abilities to assess the impact of products and systems.
17.0 Demonstrate an understanding of and be able to select and use energy and power technologies.
18.0 Demonstrate an understanding of and be able to select and use information and communication technologies.
19.0 Demonstrate an understanding of and be able to select and use transportation technologies.
20.0 Demonstrate safe and appropriate use of tools and machines in aerospace technologies.
21.0 Demonstrate an understanding of the history and development of aviation and space transportation.
22.0 Describe the aviation/aerospace environment.
23.0 Describe and demonstrate an understanding of the principles of flight.
24.0 Demonstrate an understanding of electrical, mechanical, fluid, and pneumatic systems that could be used on/in aviation/aerospace environments.
25.0 Demonstrate an understanding of power systems including, internal combustion engines, jet engines, rocket engines, solar cells and nuclear power used in aviation/aerospace applications.
26.0 Demonstrate technical knowledge of computer control as it is related to aviation/aerospace projects.
27.0 Demonstrate knowledge of robotics as it relates to the aviation/aerospace industry.
28.0 Demonstrate a knowledge and understanding of processing skills on materials and composites as they relate to aerospace technologies.
29.0 Describe and demonstrate principles of navigation.
30.0 Explore the role of civilian spacecraft in the exploration and colonization of space.
31.0 Describe various factors critical to aircraft performance.
32.0 Demonstrate appropriate skills in analyzing and evaluating technological advancements as reported by the media.

33.0 Demonstrate an understanding of the effects of flight as it relates to physiology.
34.0 Perform advanced study and technical skills related to aerospace technologies.
35.0 Demonstrate an understanding of career opportunities and requirements in the field of aerospace technologies.
36.0 Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Aerospace Technologies.
37.0 Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Aerospace Technologies.
38.0 Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Aerospace Technologies.

Florida Department of Education
Student Performance Standards

Course Title: **Aerospace Technologies I**
Course Number: **8600580**
Course Credit: **1**

Course Description:
This course provides students with an introduction to the knowledge, human relations, and technological skills found today in Aerospace Technologies.

Lab Statement:
Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental quality, and safety procedures will be an integral part of this course. Students will interact with materials and primary sources of data or with secondary sources of data to observe and understand the natural world. Students will develop an understanding of measurement error, and develop the skills to aggregate, interpret, and present the data and resulting conclusions. Equipment and supplies will be provided to enhance these hands-on experiences for students. A minimum of 20% of classroom time will be dedicated to laboratory experiences.

Florida Standards			Correlation to CTE Program Standard #
01.0	Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Aerospace Technologies.		
	01.01 Key Ideas and Details		
	01.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. LAFS.910.RST.1.1	
	01.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.910.RST.1.2	
	01.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.910.RST.1.3	
	01.02 Craft and Structure		
	01.02.1	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. LAFS.910.RST.2.4	

Florida Standards			Correlation to CTE Program Standard #
	01.02.2	Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). LAFS.910.RST.2.5	
	01.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. LAFS.910.RST.2.6	
01.03	Integration of Knowledge and Ideas		
	01.03.1	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. LAFS.910.RST.3.7	
	01.03.2	Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. LAFS.910.RST.3.8	
	01.03.3	Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. LAFS.910.RST.3.9	
01.04	Range of Reading and Level of Text Complexity		
	01.04.1	By the end of grade 9, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	01.04.2	By the end of grade 10, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 9–10 text complexity band independently and proficiently. LAFS.910.RST.4.10	
02.0	Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Aerospace Technologies.		
02.01	Text Types and Purposes		
	02.01.1	Write arguments focused on discipline-specific content. LAFS.910.WHST.1.1	
	02.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.910.WHST.1.2	

Florida Standards			Correlation to CTE Program Standard #
	02.02	Production and Distribution of Writing	
	02.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.910.WHST.2.4	
	02.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.910.WHST.2.5	
	02.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. LAFS.910.WHST.2.6	
	02.03	Research to Build and Present Knowledge	
	02.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.910.WHST.3.7	
	02.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. LAFS.910.WHST.3.8	
	02.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.910.WHST.3.9	
	02.04	Range of Writing	
	02.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.910.WHST.4.10	
03.0	Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Aerospace Technologies.		
	03.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	

Florida Standards	Correlation to CTE Program Standard #
03.02 Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
03.03 Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
03.04 Model with mathematics. MAFS.K12.MP.4.1	
03.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
03.06 Attend to precision. MAFS.K12.MP.6.1	
03.07 Look for and make use of structure. MAFS.K12.MP.7.1	
03.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
04.0	Demonstrate an understanding of the characteristics and scope of technology. – The student will be able to:		SC.912.N.1.1
04.01	Discuss the nature and development of technological knowledge and processes.	LAFS.910.RI.2.4; 3.6	
04.02	Explain the rapid increase in the rate of technological development and diffusion.	LAFS.910.W.1.2	
04.03	Conduct specific goal-directed research related to inventions and innovations.	LAFS.910.W.3.7 MAFS.912.S-IC.2.6	
05.0	Demonstrate an understanding of the core concepts of technology. – The student will be able to:		SC.912.N.1.1, 3, 4, 7
05.01	Identify systems thinking logic and creativity with appropriate compromises in complex real-life problems.	LAFS.910.SL.1.1	
05.02	Define technological systems, which are the building blocks of technology and are embedded within larger technological, social, and environmental systems.	LAFS.910.SL.1.1	
05.03	Identify the stability of a technological system and its influence by all of the components in the system, especially those in the feedback loop.	LAFS.910.SL.1.1 LAFS.910.W.1.2	
05.04	Identify resources involving trade-offs between competing values, such as availability, cost, desirability, and waste.	LAFS.910.RI.1.1, 2	
05.05	Identify the criteria and constraints of a product or system and determine how they affect the final design and development.	LAFS.910.RI.1.1, 2	

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
05.06	Define a management system as the process of planning, organizing, and controlling work.	LAFS.910.RI.1.1, 2 LAFS.910.W.1.2	
06.0	Demonstrate an understanding of the relationships among technologies and the connection between technology and other fields of study. – The student will be able to:		SC.912.N.1.1, 4, 5
06.01	Identify technology transfer occurring when a new user applies an existing innovation developed for one purpose in a different function.	LAFS.910.RI.1.1, 2	
06.02	Identify technological innovation resulting when ideas, knowledge, or skills are shared within a technology, among technologies, or across other fields.	LAFS.910.RI.1.1, 2	
06.03	Outline the process of patenting to protect a technological idea.	LAFS.910.RI.1.1, 2	
06.04	Identify technological progresses that promote the advancement of science and mathematics.	LAFS.910.RI.1.1, 2	
07.0	Demonstrate an understanding of the cultural, social, economic, and political effects of technology. – The student will be able to:		SC.912.N.4.2
07.01	Classify the use of technology involving weighing the trade-offs between the positive and the negative effects.	LAFS.910.SL.1.1; 2.4 LAFS.910.RI.3.8	
07.02	Identify ethical considerations important in the development, selection, and use of technologies.	LAFS.910.SL.1.1; 2.4 LAFS.910.RI.3.8	
07.03	List the cultural, social, economic, and political changes caused by the transfer of a technology from one society to another.	LAFS.910.SL.1.1	
08.0	Demonstrate an understanding of the effects of technology on the environment. . – The student will be able to:		SC.912.L.17.16, 17, 20
08.01	List trade-offs of developing technologies to reduce the use of resources.	LAFS.910.RI.1.1, 2 LAFS.910.W.1.1; 3.8	
08.02	Identify technologies devised to reduce the negative consequences of other technologies.	LAFS.910.RI.1.1, 1.2 LAFS.910.W.1.1, 3.8	
08.03	Discuss the implementation of technologies involving the weighing of trade-offs between predicted positive and negative effects on the environment.	LAFS.910.RI.1.1, 2 LAFS.910.W.1.1; 3.8 LAFS.910.SL.2.4,5,6	
09.0	Demonstrate an understanding of the role of society in the development and use of technology. – The student will be able to:		
09.01	Investigate how different cultures develop their own technologies to satisfy their individual and shared needs, wants, and values.	LAFS.910.RI.1.1, 2 LAFS.910.W.1.1; 3.8	
09.02	Collect societal opinions and demands, as well as corporate cultures to use as a basis for deciding whether or not to develop a technology.	LAFS.910.RI.1.1, 2 LAFS.910.W.1.1; 3.8	
09.03	Identify a number of different factors, such as advertising, the strength of the economy, the goals of a company, and the latest fads as contributors to shaping the design of and demand for various technologies.	LAFS.910.RI.1.1, 2 LAFS.910.W.1.1, 2; 3.8	
10.0	Demonstrate an understanding of the influence of technology on history. – The student will be able to:		SC.912.N.2.4; 3.2

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
10.01	Research how the evolution of civilization has been directly affected by, and has in turn affected, the development and use of tools and materials.	LAFS.910.RI.1.2 LAFS.910.W.3.7;4.10 LAFS.910.SL.1.1, 2; 2.4, 5, 6	
10.02	Define the history of technology as a powerful force in reshaping the social, cultural, political, and economic landscape.	LAFS.910.RI.1.2 LAFS.910.W.3.7;4.10 LAFS.910.SL.1.1, 2; 2.4, 5, 6	
10.03	Discuss that early in the history of technology, the development of many tools and machines was based not on scientific knowledge but on technological know-how.	LAFS.910.RI.1.2 LAFS.910.W.3.7;4.10 LAFS.910.SL.1.1, 2; 2.4, 5, 6	
10.04	Define the Iron Age as the use of iron and steel as the primary materials for tools.	LAFS.910.RI.1.2 LAFS.910.W.3.7;4.10 LAFS.910.SL.1.1, 2; 2.4, 5, 6	
10.05	Define the Industrial Revolution and the development of continuous manufacturing, sophisticated transportation and communication systems, advanced construction practices, and improved education and leisure time.	LAFS.910.RI.1.2 LAFS.910.W.3.7;4.10 LAFS.910.SL.1.1, 2; 2.4, 5, 6	
10.06	Define the Information Age and its placement of emphasis on the processing and exchange of information.	LAFS.910.RI.1.2 LAFS.910.W.3.7;4.10 LAFS.910.SL.1.1, 2; 2.4, 5, 6	
11.0	Demonstrate an understanding of the attributes of design. – The student will be able to:		SC.912.N.1.1, 3, 4, 5, 6, 7; 3.3, 5; 4.2
11.01	Recognize the design process; including defining a problem, brainstorming, researching and generating ideas, identifying criteria and specifying constraints, exploring possibilities, selecting an approach, developing a design proposal, making a model or prototype, testing and evaluating the design using specifications, refining the design, creating or making it, and communicating processes and results.	LAFS.910.RI.1.1 LAFS.910.W.3.8; 4.10 LAFS.910.L.3.6	
11.02	Restate design problems that are seldom presented in a clearly defined form.		
11.03	Check and critique a design continually, and improve and revise the idea of the design as needed.		
11.04	List competing requirements of a design, such as criteria, constraints, and efficiency.		
12.0	Demonstrate an understanding of engineering design. – The student will be able to:		SC.912.N.1.1, 3, 4, 5, 6, 7; 3.3, 5; 4.2
12.01	Identify design principles used to evaluate existing designs, to collect data, and to guide the design process.	MAFS.912.N-VM.1.1, 2, 3, 4, 5	
12.02	Describe the influence of personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly on the engineering design process.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
12.03	Construct a prototype or a working model used to test a design concept by making actual observations and necessary adjustments.		
12.04	Identify factors taken into account in the process of engineering.	MAFS.912.G-CO.1.1, 2	
13.0	Demonstrate an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving. – The student will be able to:		SC.912.N.1.1, 3, 4, 5, 6, 7; 2.1, 4, 5; 3.1, 3, 5; 4.2
13.01	Define research and development as a specific problem solving approach that is used intensively in business and industry to prepare devices and systems for the marketplace.	LAFS.1112.W.2.4, 5, 6	
13.02	Identify research needed to solve technological problems.	LAFS.910.W.3.7	
13.03	Differentiate between technological and non-technological problems, and identify which problems can be solved using technology.		
13.04	Utilize a multidisciplinary approach to solving technological problems.		
14.0	Demonstrate the abilities to apply the design process. – The student will be able to:		SC.912.N.1.1, 3, 4, 5, 6, 7; 3.3, 5; 4.2
14.01	Identify the design problem to solve and decide whether or not to address it.		
14.02	List criteria and constraints and determine how these will affect the design process.	MAFS.912.G-CO.1.1, 2	
14.03	Refine a design by using prototypes and modeling to ensure quality, efficiency, and productivity of the final product.		
14.04	Evaluate the design solution using conceptual, physical, and mathematical models at various intervals of the design process in order to check for proper design and to note areas where improvements are needed.		
14.05	Develop a product or system using a design process.	MAFS.912.G-CO.1.1, 2	
14.06	Evaluate final solutions and communicate observations, processes, and results of the entire design process, using verbal, graphic, quantitative, virtual, and written means, in addition to three-dimensional models.	LAFS.910.W.1.1, 2 LAFS.910.SL.2.4 MAFS.912.S-IC.1.6	
15.0	Demonstrate the abilities to use and maintain technological products and systems. – The student will be able to:		SC.912.N.1.1
15.01	Document processes and procedures and communicate them to different audiences using appropriate oral and written techniques.	LAFS.910.W.1.2 LAFS.910.SL.2.4	
15.02	Diagnose a system that is malfunctioning and use tools, materials, machines, and knowledge to repair it.	LAFS.910.RI.1.1	
15.03	Troubleshoot, analyze, and maintain systems to ensure safe and proper function and precision.	LAFS.910.RI.1.1	
15.04	Operate systems so that they function in the way they were designed.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
15.05	Use computers and calculators to access, retrieve, organize, process, maintain, interpret, and evaluate data and information in order to communicate.		
16.0	Demonstrate the abilities to assess the impact of products and systems. – The student will be able to:	MAFS.912.S-IC.2	SC.912.L.17.4, 16 SC.912.N.1.1, 4, 6
16.01	Collect information and evaluate its quality.	MAFS.912.S-IC.2.5	
16.02	Synthesize data, analyze trends, and draw conclusions regarding the effect of technology on the individual, society, and the environment.	MAFS.912.S-IC.2.6	
16.03	Define assessment techniques, such as trend analysis and experimentation to make decisions about the future development of technology.		
16.04	Identify forecasting techniques to evaluate the results of altering natural systems.		
17.0	Demonstrate an understanding of and be able to select and use energy and power technologies. – The student will be able to:		SC.912.P.10.1, 3
17.01	Discuss how energy cannot be created nor destroyed; however, it can be converted from one form to another.	LAFS.910.SL.1.1	
17.02	Categorize types of energy into major forms: thermal, radiant, electrical, mechanical, chemical, nuclear, and others.		
17.03	Explain impossibility of building an engine to perform work that does not exhaust thermal energy to the surroundings.	LAFS.910.SL.1.1 LAFS.910.W.1.2	
17.04	Classify energy resources as renewable or nonrenewable.		
17.05	Construct a power system having a source of energy, a process, and loads.		
18.0	Demonstrate an understanding of and be able to select and use information and communication technologies. – The student will be able to:		
18.01	Discuss information and communication technologies including the inputs, processes, and outputs associated with sending and receiving information.	LAFS.910.SL.1.1	
18.02	Classify information and communication systems that allow information to be transferred as human to human, human to machine, machine to human, or machine to machine.	LAFS.910.RI.1.2	
18.03	Use information and communication systems to inform, persuade, entertain, control, manage, and educate.	LAFS.910.RI.1.2	
18.04	Identify components of a communications system, including source, encoder, transmitter, receiver, decoder, storage, retrieval, and destination.		
18.05	Identify many ways to communicate information, such as graphic and electronic means.		
18.06	Communicate technological knowledge and processes using symbols, measurement, conventions, icons, graphic images, and languages that incorporate a variety of visual, auditory, and tactile stimuli.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
19.0	Demonstrate an understanding of and be able to select and use transportation technologies. – The student will be able to:		
19.01	Analyze the vital role played by transportation in the operation of other technologies, such as manufacturing, construction, communication, health and safety, and agriculture.	LAFS.910.RI.1.1	
19.02	Define intermodalism as the use of different modes of transportation, such as highways, railways, and waterways as part of an interconnected system that can move people and goods easily from one mode to another.	LAFS.910.L.3.6 LAFS.910.RI.1.1	
19.03	Discuss how transportation services and methods have led to a population that is regularly on the move.	LAFS.910.SL.1.1	
19.04	Identify processes and innovative techniques involved in the design of intelligent and non-intelligent transportation systems.	LAFS.910.RI.1.2	
20.0	Demonstrate safe and appropriate use of tools and machines in aviation/aerospace technologies. – The student will be able to:		
20.01	Select appropriate tools, procedures, and/or equipment.		
20.02	Demonstrate the safe usage of appropriate tools, procedures, and operation of equipment.		
20.03	Maintain and troubleshoot equipment used in a variety of technological systems.		
20.04	Follow laboratory safety rules and procedures.		
20.05	Demonstrate good housekeeping at workstation within total laboratory.		
20.06	Identify color-coding safety standards.		
20.07	Explain fire prevention and safety precautions and practices for extinguishing fires.		
20.08	Identify harmful effects/potential dangers of familiar hazardous substances/devices to people and the environment.		
21.0	Demonstrate an understanding of the history and development of aviation and space transportation. – The student will be able to:		SC.912.E.5.7, 9
21.01	Describe early attempts at flight prior to the Wright Brothers flight in 1902.	LAFS.910.SL.2.4,5,6	
21.02	Outline the early attempts at heavier than air powered flight.	LAFS.910.W.4.10	
21.03	Describe the affect of air power on the outcome of world conflict.	LAFS.910.SL.2.4,5,6	
21.04	Describe the history of aviation in Florida.	LAFS.910.SL.2.4,5,6	
21.05	Outline the beginnings of commercial aviation.	LAFS.910.W.4.10	

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
21.06	Identify the early research centers for aeronautics in the United States.		
21.07	Describe the role of aviation research and development.	LAFS.910.SL.2.4,5,6	
21.08	Outline the development of space exploration.	LAFS.910.W.4.10	
21.09	Describe the role of NACA and NASA in the development of aeronautics and space exploration.	LAFS.910.SL.2.4,5,6	
21.10	Prepare a forecast of aerospace developments, and interplanetary space travel.	LAFS.910.SL.2.4	
22.0	Describe the aviation/aerospace environment. – The student will be able to:		SC.912.E.5.4, 6; 7.3, 4, 5, 6 SC.912.L.17.4; 18.12 SC.912.P.12.2, 3, 7
22.01	Identify atmospheric regions and elements.		
22.02	Describe the roles of water and particulate matter in the atmosphere.	LAFS.910.SL.2.4	
22.03	Describe and identify the elements of the atmosphere in motion.	LAFS.910.SL.2.4 MAFS.912.N-VM.2.4, 5	
22.04	Explain the role weather forecasting has as it relates to Aerospace Technologies.	LAFS.910.W.1.2	
22.05	Demonstrate an understanding of the principal bodies of the universe.		
22.06	Utilize astronomical principles, and technology to study the solar systems.		
22.07	Develop a radio telemetry system to measure temperature, pressure, humidity, or acceleration during a rocket flight.		
22.08	Define interplanetary space.	LAFS.910.L.3.6	
22.09	Describe the physical properties of interplanetary space including the structure, formation, forces, and bodies.	LAFS.910.SL.2.4, 5	
22.10	Describe interstellar and intergalactic space.	LAFS.910.SL.2.4, 5	
23.0	Describe and demonstrate an understanding of the principles of flight. – The student will be able to:		SC.912.P.10.1, 7; 12.2, 3
23.01	Define terminology associated with flight and flight principles.	LAFS.910.L.3.6	
23.02	Identify the structural components of aircraft.	LAFS.910.SL.1.1	
23.03	Construct and test flying models of lighter-than-air craft.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	23.04 Demonstrate an understanding of a powered aircraft and the use of control surfaces to control flight characteristics of pitch, yaw and roll.		
	23.05 Demonstrate an understanding of rocketry design and systems.		
	23.06 Develop and construct models to test flight characteristics of powered aircraft.		
	23.07 Explain the application of Newton's laws to flight and rocketry.	LAFS.910.W.1.2 LAFS.910.SL.1.1	
24.0	Demonstrate an understanding of electrical, mechanical, fluid, and pneumatic systems that could be used on/in aviation/aerospace environments. – The student will be able to:		SC.912.P.10.1, 3; 12.2, 3
	24.01 Demonstrate the concepts of force, work, rate, resistance, energy and power through the use of various mechanical sub systems, include: gears, belts, valves, chains, pulleys, screws, cams, linkages, rods, and sprockets or mechanical trainers.	MAFS.912.A-CED.1.4	
	24.02 Demonstrate the concepts of force, work rate, resistance, and power through the use of various fluid subsystems, including: fluid manometers, hydraulic lifts, pipes, valves, tanks, air gauges of hydraulic trainers, and pneumatic trainers.	MAFS.912.A-CED.1.4	
	24.03 Demonstrate the concepts of force, work, rate, resistance, energy, and power through the use of various electrical sub system, including: conductors, control elements, electrical loads, voltage sources, current sources, circuits, components, and measurement equipment, or electrical/electronic trainers.	MAFS.912.A-CED.1.4	
25.0	Demonstrate an understanding of power systems including, internal combustion engines, jet engines, rocket engines, solar cells and nuclear power used in aviation/aerospace applications. – The student will be able to:		SC.912.N.1.1 SC.912.P.10.1, 7; 12.2, 3
	25.01 Identify the basic types of engines used for aircraft propulsion.	LAFS.910.SL.1.1	
	25.02 Describe the change from linear motion to rotary motion in a reciprocating engine.		
	25.03 Identify the elements of an aircraft engine and fuel system.	LAFS.910.SL.1.1	
	25.04 Describe the operation of aircraft turbine and ramjet engines.	LAFS.910.SL.1.1	
	25.05 Explain chemical propulsion systems.	LAFS.910.W.1.2	
	25.06 Explain advanced propulsion systems including heavy lift launch systems, electrical propulsion, and nuclear propulsion.	LAFS.910.SL.1.1; 2.5 LAFS.910.W.1.2	
	25.07 Describe the use and operation of solar cells to generate electrical power.	LAFS.910.SL.1.1; 2.5 LAFS.910.W.1.2	
	25.08 Perform experimental testing, including designing test devices to determine the power (thrust) of a model rocket engine.	LAFS.910.SL.1.1; 2.5 LAFS.910.W.1.2 MAFS.912.A-CED.1.4 MAFS.912.S-IC.2.6	

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
26.0	Demonstrate technical knowledge of computer control as it is related to aviation/aerospace projects. – The student will be able to:		SC.912.N.1.1, 3, 4, 5, 6, 7; 3.3, 5; 4.2
26.01	Demonstrate the application of a computer and software program to develop a plan for an aerospace vehicle.		
26.02	Demonstrate an ability to perform a milling, engraving or turning operation utilizing a computer assisted manufacturing program.		
26.03	Demonstrate problem-solving skills relative to computer assisted manufacturing related to the aerospace industry.		
26.04	Demonstrate an ability to develop programs to control flight operations and/or testing procedures.		
27.0	Demonstrate knowledge of robotics as it relates to the aviation/aerospace industry. – The student will be able to:		SC.912.N.1.1, 3, 4, 5, 6, 7; 3.3, 5; 4.2
27.01	Identify different types of robots.	LAFS.910.RI.1.1, 2	
27.02	State the function of effectors, sensors, controllers, and auxiliary parts in robotics system.		
27.03	Program a robot using a computer to perform a specific task.		
27.04	Explain how robotics technology is used in the space program.		
27.05	Demonstrate problem-solving skills using robotics technology as it applies to Aerospace Technologies experiments and programs.		
27.06	Forecast how robotics technology will be used in the exploration of space, space colonization or interplanetary space travel.		
28.0	Demonstrate a knowledge and understanding of processing skills on materials and composites as they relate to aviation/aerospace technologies. – The student will be able to:		
28.01	Identify tools, machines and equipment in the laboratory and explain their functions.	LAFS.910.RI.1.1, 2	
28.02	Select appropriate tools, machines and equipment to accomplish a given task.		
28.03	Demonstrate safe and correct use of tools, machines and equipment.		
28.04	Identify various industrial raw materials.	LAFS.910.RI.1.1	
28.05	Perform processing skills on materials and composites as needed to develop aerospace vehicles, models, experimental fixtures, and apparatus.		
30.0	Explore the role of civilian spacecraft in the exploration and colonization of space. – The student will be able to:		SC.912.E.5.6, 7, 10, 11
30.01	Participate in the development of a study for a model of manned interplanetary space travel.		
30.02	Develop a plan for scientific research to be performed on a space station facility.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
30.03	Develop a plan for flight crew training for a manned space flight.		
30.04	Research, develop, plan, and build model structures of space colonization structures.	LAFS.910.W.3.7 MAFS.912.G-CO.1.1, 2 MAFS.912.S-IC.2.6	
30.05	Develop plans, models and a visual presentation of a manned space flight to a distant planet in the solar system.	LAFS.910.W.3.8	
30.06	Examine methods of sending and receiving messages and controlling telemetry from space.		
31.0	Describe various factors critical to aircraft performance. – The student will be able to:		
31.01	Describe aircraft weight and balance terms and factors.	LAFS.910.RI.1.2 MAFS.921.N-VM.1.1, 2, 3, 4, 5	
31.02	Calculate an aircraft's center of gravity (CG).		
31.03	Describe how runway length affects aircraft performance.	LAFS.910.RI.1.2	
31.04	Describe how atmospheric pressure and altitude affects aircraft performance.	LAFS.910.RI.1.2 MAFS.912.F-TF.1.3; 2.5, 7	
31.05	Describe implications to aircraft performance under Visual Flight Rules (VFR) and Instrument Flight Rules (IFR) conditions.	LAFS.910.RI.1.2	
31.06	Describe class of airspace and discuss how it impacts aircraft performance.	LAFS.910.RI.1.2	
31.07	Discuss engine and fuel issues/conditions relative to aircraft performance.	LAFS.910.SL.1.1 MAFS.912.A-CED.1.4	
31.08	Explain the role of instrumentation relative to aircraft performance.	LAFS.910.SL.1.1 LAFS.910.W.1.2	
31.09	Describe how aircraft design impacts aircraft performance.	LAFS.910.W.1.2 LAFS.910.SL.2.4,5,6	
31.10	Describe how meteorological conditions affect aircraft performance.		
31.11	Explain how the type of aircraft (e.g., fixed wing, rotary wing, commercial, military, utility, etc.) impacts aircraft performance.	LAFS.910.W.1.2 LAFS.910.SL.2.4,5,6	

Florida Department of Education
Student Performance Standards

Course Title: **Aerospace Technologies II**
Course Number: **8600680**
Course Credit: **1**

Course Description:
This program provides students with an intermediate understanding of the knowledge, human relations, and technological skills found today in Aerospace Technologies.

Lab Statement:
Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental quality, and safety procedures will be an integral part of this course. Students will interact with materials and primary sources of data or with secondary sources of data to observe and understand the natural world. Students will develop an understanding of measurement error, and develop the skills to aggregate, interpret, and present the data and resulting conclusions. Equipment and supplies will be provided to enhance these hands-on experiences for students. A minimum of 20% of classroom time will be dedicated to laboratory experiences.

Florida Standards			Correlation to CTE Program Standard #
01.0	Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Aerospace Technologies.		
	01.01 Key Ideas and Details		
	01.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. LAFS.910.RST.1.1	
	01.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.910.RST.1.2	
	01.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.910.RST.1.3	
	01.02 Craft and Structure		
	01.02.1	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. LAFS.910.RST.2.4	

Florida Standards			Correlation to CTE Program Standard #
	01.02.2	Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). LAFS.910.RST.2.5	
	01.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. LAFS.910.RST.2.6	
01.03	Integration of Knowledge and Ideas		
	01.03.1	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. LAFS.910.RST.3.7	
	01.03.2	Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. LAFS.910.RST.3.8	
	01.03.3	Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. LAFS.910.RST.3.9	
01.04	Range of Reading and Level of Text Complexity		
	01.04.1	By the end of grade 9, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	01.04.2	By the end of grade 10, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 9–10 text complexity band independently and proficiently. LAFS.910.RST.4.10	
02.0	Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Aerospace Technologies.		
02.01	Text Types and Purposes		
	02.01.1	Write arguments focused on discipline-specific content. LAFS.910.WHST.1.1	
	02.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.910.WHST.1.2	

Florida Standards			Correlation to CTE Program Standard #
	02.02	Production and Distribution of Writing	
	02.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.910.WHST.2.4	
	02.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.910.WHST.2.5	
	02.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. LAFS.910.WHST.2.6	
	02.03	Research to Build and Present Knowledge	
	02.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.910.WHST.3.7	
	02.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. LAFS.910.WHST.3.8	
	02.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.910.WHST.3.9	
	02.04	Range of Writing	
	02.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.910.WHST.4.10	
03.0	Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Aerospace Technologies.		
	03.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	

Florida Standards	Correlation to CTE Program Standard #
03.02 Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
03.03 Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
03.04 Model with mathematics. MAFS.K12.MP.4.1	
03.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
03.06 Attend to precision. MAFS.K12.MP.6.1	
03.07 Look for and make use of structure. MAFS.K12.MP.7.1	
03.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
04.0	Demonstrate an understanding of the characteristics and scope of technology. – The student will be able to:		SC.912.N.1.1
04.01	Discuss the nature and development of technological knowledge and processes.	LAFS.910.RI.2.4 LAFS.910.L.3.6	
04.02	Explain the rapid increase in the rate of technological development and diffusion.	LAFS.910.W.1.2	
04.03	Conduct specific goal-directed research related to inventions and innovations.	LAFS.910.W.3.7 MAFS.912.S-IC.2.6	
05.0	Demonstrate an understanding of the core concepts of technology. – The student will be able to:		SC.912.N.1.1, 3, 4, 7
05.01	Apply systems thinking logic and creativity with appropriate compromises in complex real-life problems.	LAFS.910.SL.1.1	
05.02	Discuss technological systems, which are the building blocks of technology and are embedded within larger technological, social, and environmental systems.	LAFS.910.SL.1.1	
05.03	Assess the stability of a technological system and its influence by all of the components in the system, especially those in the feedback loop.	LAFS.910.SL.1.1 LAFS.910.W.1.2	
05.04	Select resources involving trade-offs between competing values, such as availability, cost, desirability, and waste.	LAFS.910.RI.1.1, 2	

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
05.05	Identify the criteria and constraints of a product or system and determine how they affect the final design and development.	LAFS.910.RI.1.1, 2	
05.06	Identify new technologies that create new processes.	LAFS.910.RI.1.1, 2	
05.07	Implement a quality control process to ensure that a product, service or system meets established criteria.	LAFS.910.RI.1.1, 2 LAFS.910.W.1.2	
05.08	Organize a management system as the process of planning, organizing, and controlling work.		
06.0	Demonstrate an understanding of the relationships among technologies and the connection between technology and other fields of study. – The student will be able to:		SC.912.N.1.1, 4, 5
06.01	Discuss technology transfer occurring when a new user applies an existing innovation developed for one purpose in a different function.	LAFS.910.SL.1.1 LAFS.910.W.4.10	
06.02	Explain technological innovation resulting when ideas, knowledge, or skills are shared within a technology, among technologies, or across other fields.	LAFS.910.SL.1.1 LAFS.910.W.4.10	
06.03	Discuss technological progresses that promote the advancement of science and mathematics.	LAFS.910.SL.1.1 LAFS.910.W.4.10	
07.0	Demonstrate an understanding of the cultural, social, economic, and political effects of technology. – The student will be able to:		SC.912.N.4.2
07.01	Compare the use of technology involving weighing the trade-offs between the positive and the negative effects.	LAFS.910.SL.1.1; 2.4 LAFS.910.RI.3.8	
07.02	Discuss ethical considerations important in the development, selection, and use of technologies.	LAFS.910.SL.1.1; 2.4 LAFS.910.RI.3.8	
07.03	Debate the cultural, social, economic, and political changes caused by the transfer of a technology from one society to another.	LAFS.910.SL.1.1	
08.0	Demonstrate an understanding of the effects of technology on the environment. . – The student will be able to:		SC.912.L.17.16, 17, 20
08.01	Compare trade-offs of developing technologies to reduce the use of resources.	LAFS.910.RI.1.1 LAFS.910.W.1.1; 3.8 LAFS.910.SL.1.2	
08.02	Assess technologies devised to reduce the negative consequences of other technologies.	LAFS.910.RI.1.1 LAFS.910.W.1.1; 3.8 LAFS.910.SL.1.2	
08.03	Make decisions about the implementation of technologies involving the weighing of trade-offs between predicted positive and negative effects on the environment.	LAFS.910.RI.1.1 LAFS.910.W.1.1; 3.8 LAFS.910.SL.1.2	
09.0	Demonstrate an understanding of the role of society in the development and use of technology. – The student will be able to:		
09.01	Report how different cultures develop their own technologies to satisfy their individual and shared needs, wants, and values.	LAFS.910.W.1.1	

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
09.02	Consider societal opinions and demands, as well as corporate cultures to use as a basis for deciding whether or not to develop a technology.		
09.03	Consider a number of different factors, such as advertising, the strength of the economy, the goals of a company, and the latest fads as contributors to shaping the design of and demand for various technologies.		
10.0	Demonstrate an understanding of the influence of technology on history. – The student will be able to:		SC.912.N.2.4; 3.2
10.01	Discuss how the evolution of civilization has been directly affected by, and has in turn affected, the development and use of tools and materials.	LAFS.910.SL.1.1, 2; 2.4, 5, 6	
10.02	Research the history of technology as a powerful force in reshaping the social, cultural, political, and economic landscape.	LAFS.910.SL.1.1, 2; 2.4, 5, 6 LAFS.910.W.3.7, 8	
10.03	Debate that early in the history of technology, the development of many tools and machines was based not on scientific knowledge but on technological know-how.	LAFS.910.SL.1.1, 2; 2.4, 5, 6	
10.04	Discuss the Industrial Revolution and the development of continuous manufacturing, sophisticated transportation and communication systems, advanced construction practices, and improved education and leisure time.	LAFS.910.SL.1.1, 2; 2.4, 5, 6	
10.05	Discuss the Information Age and its placement of emphasis on the processing and exchange of information.		
11.0	Demonstrate an understanding of the attributes of design. – The student will be able to:		SC.912.N.1.1, 3, 4, 5, 6, 7; 3.3, 5; 4.2
11.01	Apply the design process; including defining a problem, brainstorming, researching and generating ideas, identifying criteria and specifying constraints, exploring possibilities, selecting an approach, developing a design proposal, making a model or prototype, testing and evaluating the design using specifications, refining the design, creating or making it, and communicating processes and results.		
11.02	Translate design problems that are seldom presented in a clearly defined form.		
11.03	Evaluate a design continually, and improve and revise the idea of the design as needed.		
11.04	Analyze competing requirements of a design, such as criteria, constraints, and efficiency.		
12.0	Demonstrate an understanding of engineering design. – The student will be able to:		SC.912.N.1.1, 3, 4, 5, 6, 7; 2.2; 3.3, 5; 4.2
12.01	Investigate design principles used to evaluate existing designs, to collect data, and to guide the design process.		
12.02	Examine the influence of personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly on the engineering design process.	MAFS.921.N-VM.1.1, 2, 3, 4, 5	
12.03	Construct a prototype or a working model used to test a design concept by making actual observations and necessary adjustments.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
12.04	Evaluate factors taken into account in the process of engineering.	MAFS.912.G-CO.1.1, 2	
13.0	Demonstrate an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving. – The student will be able to:		SC.912.N.1.1, 3, 4, 5, 6, 7; 2.1, 4, 5; 3.1, 3, 5; 4.2
13.01	Employ research and development as a specific problem solving approach that is used intensively in business and industry to prepare devices and systems for the marketplace.	LAFS.1112.W.2.4, 5, 6	
13.02	Conduct research needed to solve technological problems.	LAFS.910.W.3.7	
13.03	Differentiate between technological and non-technological problems, and identify which problems can be solved using technology.		
13.04	Utilize a multidisciplinary approach to solving technological problems.		
14.0	Demonstrate the abilities to apply the design process. – The student will be able to:		SC.912.N.1.1, 3, 4, 5, 6, 7; 3.3, 5; 4.2
14.01	Interpret the design problem to solve and decide whether or not to address it.		
14.02	Evaluate criteria and constraints and determine how these will affect the design process.	MAFS.912.G-CO.1.1, 2	
14.03	Refine a design by using prototypes and modeling to ensure quality, efficiency, and productivity of the final product.		
14.04	Evaluate the design solution using conceptual, physical, and mathematical models at various intervals of the design process in order to check for proper design and to note areas where improvements are needed.		
14.05	Produce a product or system using a design process.	MAFS.912.G-CO.1.1, 2	
14.06	Evaluate final solutions and communicate observations, processes, and results of the entire design process, using verbal, graphic, quantitative, virtual, and written means, in addition to three-dimensional models.	LAFS.910.W.1.1, 2 LAFS.910.SL.2.4 MAFS.912.S-IC.2.6	
15.0	Demonstrate the abilities to use and maintain technological products and systems. – The student will be able to:		SC.912.N.1.1
15.01	Document processes and procedures and communicate them to different audiences using appropriate oral and written techniques.	LAFS.910.W.1.1 LAFS.910.SL.2.4	
15.02	Diagnose a system that is malfunctioning and use tools, materials, machines, and knowledge to repair it.	LAFS.910.RI.1.1	
15.03	Troubleshoot, analyze, and maintain systems to ensure safe and proper function and precision.	LAFS.910.RI.1.1	
15.04	Operate systems so that they function in the way they were designed.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
15.05	Use computers and calculators to access, retrieve, organize, process, maintain, interpret, and evaluate data and information in order to communicate.		
16.0	Demonstrate the abilities to assess the impact of products and systems. – The student will be able to:	MAFS.912.S-IC.2	SC.912.L.17.4, 16 SC.912.N.1.1, 4, 6
16.01	Collect information and evaluate its quality.	MAFS.912.S-IC.2.5	
16.02	Synthesize data, analyze trends, and draw conclusions regarding the effect of technology on the individual, society, and the environment.	MAFS.912.S-IC.2.6	
16.03	Apply assessment techniques, such as trend analysis and experimentation to make decisions about the future development of technology.	MAFS.912.S-IC.2.6	
16.04	Design forecasting techniques to evaluate the results of altering natural systems.		
17.0	Demonstrate an understanding of and be able to select and use energy and power technologies. – The student will be able to:		SC.912.P.10.1, 3
17.01	Discuss how energy cannot be created nor destroyed; however, it can be converted from one form to another.	LAFS.910.SL.1.1	
17.02	Categorize types of energy into major forms: thermal, radiant, electrical, mechanical, chemical, nuclear, and others.		
17.03	Explain impossibility of building an engine to perform work that does not exhaust thermal energy to the surroundings.	LAFS.910.SL.1.1 LAFS.910.W.1.2	
17.04	Classify energy resources as renewable or nonrenewable.		
17.05	Construct a power system having a source of energy, a process, and loads.		
18.0	Demonstrate an understanding of and be able to select and use information and communication technologies. – The student will be able to:		
18.01	Discuss information and communication technologies including the inputs, processes, and outputs associated with sending and receiving information.	LAFS.910.SL.1.1	
18.02	Classify information and communication systems that allow information to be transferred as human to human, human to machine, machine to human, or machine to machine.	LAFS.910.SL.1.2	
18.03	Use information and communication systems to inform, persuade, entertain, control, manage, and educate.	LAFS.910.SL.1.2	
18.04	Identify components of a communications system, including source, encoder, transmitter, receiver, decoder, storage, retrieval, and destination.		
18.05	Identify many ways to communicate information, such as graphic and electronic means.		
18.06	Communicate technological knowledge and processes using symbols, measurement, conventions, icons, graphic images, and languages that incorporate a variety of visual, auditory, and tactile stimuli.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
19.0	Demonstrate an understanding of and be able to select and use transportation technologies. – The student will be able to:		
19.01	Analyze the vital role played by transportation in the operation of other technologies, such as manufacturing, construction, communication, health and safety, and agriculture.	LAFS.910.RI.1.1	
19.02	Define intermodalism as the use of different modes of transportation, such as highways, railways, and waterways as part of an interconnected system that can move people and goods easily from one mode to another.	LAFS.910.RI.1.1 LAFS.910.L.3.6	
19.03	Discuss how transportation services and methods have led to a population that is regularly on the move.	LAFS.910.SL.1.1	
19.04	Identify processes and innovative techniques involved in the design of intelligent and non-intelligent transportation systems.	LAFS.910.RI.1.2	
20.0	Demonstrate safe and appropriate use of tools and machines in aviation/aerospace technologies. – The student will be able to:		
20.01	Select appropriate tools, procedures, and/or equipment.		
20.02	Demonstrate the safe usage of appropriate tools, procedures, and operation of equipment.		
20.03	Maintain and troubleshoot equipment used in a variety of technological systems.		
20.04	Follow laboratory safety rules and procedures.	LAFS.910.RI.1.2	
20.05	Demonstrate good housekeeping at workstation within total laboratory.		
20.06	Identify color-coding safety standards.		
20.07	Explain fire prevention and safety precautions and practices for extinguishing fires.		
20.08	Identify harmful effects/potential dangers of familiar hazardous substances/devices to people and the environment.		
21.0	Demonstrate an understanding of the history and development of aviation and space transportation. – The student will be able to:		SC.912.E.5.7, 9
21.01	Describe early attempts at flight prior to the Wright Brothers flight in 1902.	LAFS.910.W.4.10	
21.02	Outline the early attempts at heavier than air powered flight.	LAFS.910.W. 4.10	
21.03	Describe the affect of air power on the outcome of world conflict.	LAFS.910.W. 4.10 LAFS.910.SL.2.4, 5	
21.04	Describe the history of aviation in Florida.	LAFS.910.W. 4.10 LAFS.910.SL.2.6	
21.05	Outline the beginnings of commercial aviation.	LAFS.910.W. 4.10 LAFS.910.SL.2.6	

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
21.06	Identify the early research centers for aeronautics in the United States.	LAFS.910.W. 4.10 LAFS.910.SL.2.6	
21.07	Describe the role of aviation research and development.	LAFS.910.W. 4.10 LAFS.910.SL.2.6	
21.08	Outline the development of space exploration.	LAFS.910.W. 4.10	
21.09	Describe the role of NACA and NASA in the development of aeronautics and space exploration.	LAFS.910.W. 4.10	
21.10	Prepare a forecast of aerospace developments, and interplanetary space travel.	LAFS.910.SL.2.4	
22.0	Describe the aviation/aerospace environment. – The student will be able to:		SC.912.E.5.4, 6; 7.3, 4, 5, 6; SC.912.L.17.4; 18.12 SC.912.P.12.2, 3, 7
22.01	Identify atmospheric regions and elements.		
22.02	Describe the roles of water and particulate matter in the atmosphere.	LAFS.910.SL.2.4	
22.03	Describe and identify the elements of the atmosphere in motion.	LAFS.910.SL.2.4 MAFS.912.N-VM.2.4, 5	
22.04	Explain the role weather forecasting has as it relates to Aerospace Technologies.	LAFS.910.W. 1.2	
22.05	Demonstrate an understanding of the principal bodies of the universe.		
22.06	Utilize astronomical principles, and technology to study the solar systems.		
22.07	Develop a radio telemetry system to measure temperature, pressure, humidity, or acceleration during a rocket flight.		
22.08	Define interplanetary space.	LAFS.910.L.3.6	
22.09	Describe the physical properties of interplanetary space including the structure, formation, forces, and bodies.	LAFS.910.SL.2.4, 5	
22.10	Describe interstellar and intergalactic space.	LAFS.910.SL.2.4, 5	
23.0	Describe and demonstrate an understanding of the principles of flight. – The student will be able to:		SC.912.P.10.1, 7; 12.2, 3
23.01	Define terminology associated with flight and flight principles.	LAFS.910.L.3.6	
23.02	Identify the structural components of aircraft.	LAFS.910.SL.1.1	
23.03	Construct and test flying models of lighter-than-air craft.		
23.04	Demonstrate an understanding of a powered aircraft and the use of control surfaces to control flight characteristics of pitch, yaw and roll.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	23.05 Demonstrate an understanding of rocketry design and systems.		
	23.06 Develop and construct models to test flight characteristics of powered aircraft.		
	23.07 Explain the application of Newton's laws to flight and rocketry.	LAFS.910.SL.1.1 LAFS.910.W.1.2	
24.0	Demonstrate an understanding of electrical, mechanical, fluid, and pneumatic systems that could be used on/in aviation/aerospace environments. – The student will be able to:		SC.912.P.10.1, 3; 12.2, 3
	24.01 Demonstrate the concepts of force, work, rate, resistance, energy and power through the use of various mechanical sub systems, include: gears, belts, valves, chains, pulleys, screws, cams, linkages, rods, and sprockets or mechanical trainers.	MAFS.912.A-CED.1.4	
	24.02 Demonstrate the concepts of force, work rate, resistance, and power through the use of various fluid subsystems, including: fluid manometers, hydraulic lifts, pipes, valves, tanks, air gauges of hydraulic trainers, and pneumatic trainers.	MAFS.912.A-CED.1.4	
	24.03 Demonstrate the concepts of force, work, rate, resistance, energy, and power through the use of various electrical sub system, including: conductors, control elements, electrical loads, voltage sources, current sources, circuits, components, and measurement equipment, or electrical/electronic trainers.	MAFS.912.A-CED.1.4	
25.0	Demonstrate an understanding of power systems including, internal combustion engines, jet engines, rocket engines, solar cells and nuclear power used in aviation/aerospace applications. – The student will be able to:		SC.912.N.1.1, SC.912.P.10.1, 7; 12.2, 3
	25.01 Identify the basic types of engines used for aircraft propulsion.	LAFS.910.SL.1.1	
	25.02 Describe the change from linear motion to rotary motion in a reciprocating engine.	LAFS.910.W.1.2	
	25.03 Identify the elements of an aircraft engine and fuel system.	LAFS.910.SL.1.1	
	25.04 Describe the operation of aircraft turbine and ramjet engines.	LAFS.910.SL.1.1	
	25.05 Explain chemical propulsion systems.	LAFS.910.W.1.2	
	25.06 Explain advanced propulsion systems including heavy lift launch systems, electrical propulsion, and nuclear propulsion.	LAFS.910.SL.1.1; 2.5	
	25.07 Describe the use and operation of solar cells to generate electrical power.		
	25.08 Perform experimental testing, including designing test devices to determine the power (thrust) of a model rocket engine.	MAFS.912.A-CED.1.4 MAFS.912.S-IC.2.6	
26.0	Demonstrate technical knowledge of computer control as it is related to aviation/aerospace projects. – The student will be able to:		SC.912.N.1.1, 3, 4, 5, 6, 7; 3.3, 5; 4.2
	26.01 Demonstrate the application of a computer and software program to develop a plan for an aerospace vehicle.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
26.02	Demonstrate an ability to perform a milling, engraving or turning operation utilizing a computer assisted manufacturing program.		
26.03	Demonstrate problem-solving skills relative to computer assisted manufacturing related to the aerospace industry.		
26.04	Demonstrate an ability to develop programs to control flight operations and/or testing procedures.		
27.0	Demonstrate knowledge of robotics as it relates to the aviation/aerospace industry. – The student will be able to:		SC.912.N.1.1, 3, 4, 5, 6, 7; 3.3, 5; 4.2
27.01	Identify different types of robots.	LAFS.910.R.1.1, 2	
27.02	State the function of effectors, sensors, controllers, and auxiliary parts in robotics system.		
27.03	Program a robot using a computer to perform a specific task.		
27.04	Explain how robotics technology is used in the space program.		
27.05	Demonstrate problem-solving skills using robotics technology as it applies to Aerospace Technologies experiments and programs.		
27.06	Forecast how robotics technology will be used in the exploration of space, space colonization or interplanetary space travel.		
28.0	Demonstrate knowledge and understanding of processing skills on materials and composites as they relate to aviation/aerospace technologies. – The student will be able to:		
28.01	Identify tools, machines and equipment in the laboratory and explain their functions.	LAFS.910.R.1.1, 2	
28.02	Select appropriate tools, machines and equipment to accomplish a given task.		
28.03	Demonstrate safe and correct use of tools, machines and equipment.		
28.04	Identify various industrial raw materials.		
28.05	Perform processing skills on materials and composites as needed to develop aerospace vehicles, models, experimental fixtures, and apparatus.		
29.0	Describe and demonstrate principles of navigation. – The student will be able to:	MAFS.912.S-IC.2	SC.912.E.5.5, 10, 11 SC.912.P.12.1, 7, 9
29.01	Describe navigation principles as they relate to aeronautical travel.	LAFS.910.R.1.2	
29.02	Demonstrate and ability to read and use an aeronautical navigational chart.	LAFS.910.L.3.6	
29.03	Examine navigational technologies and systems as they relate to aeronautical systems.		
29.04	Complete a flight plan for a fixed wing aircraft, from destination to destination.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
29.05	Demonstrate an understanding and application of mathematical concepts as they relate to determining space flight mechanics.		
29.06	Demonstrate an ability to compute a space flight orbit.		
29.07	Define and describe a variety of orbital patterns.		
33.0	Demonstrate an understanding of the effects of flight as it relates to physiology. – The student will be able to:		SC.912.L.14.21, 22, 29, 30, 34, 36, 39 42, 43, 44, 46, 49
33.01	Construct human data charts to determine the variation in body dimensions of human subjects.	MAFS.912.S-IC.2.6	
33.02	Evaluate products and fixtures used in aerospace environments and assess their suitability for human use.		
33.03	Develop test procedures for measuring human performance including but not limited to: visual perception, ability to withstand stress, ability to live in a restricted environment, requirements for nutrition, exercise and other physical needs as may be determined by research and development of aerospace projects.		
34.0	Perform advanced study and technical skills related to aviation/aerospace technologies. – The student will be able to:		SC.912.N.1.1, 3, 4, 5, 6, 7; 3.3, 5; 4.2
34.01	Identify an aerospace problem or product for improvement using the design methodology.		
34.02	Develop a written plan of work for the design team to carry out the project.	LAFS.910.W.1.2	
34.03	Show evidence of technical study in support of the project.	LAFS.910.W.1.1	
34.04	Perform skills related to the aerospace project.		
34.05	Complete the project as planned.		
34.06	Demonstrate or present the design solution to the problem.	LAFS.910.SL.2.4,5,6	

Florida Department of Education
Student Performance Standards

Course Title: **Aerospace Technologies III**
Course Number: **8601780**
Course Credit: **1**

Course Description:
This program provides students with an advanced understanding of the knowledge, human relations, and technological skills found today in Aerospace Technologies.

Lab Statement:
Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental quality, and safety procedures will be an integral part of this course. Students will interact with materials and primary sources of data or with secondary sources of data to observe and understand the natural world. Students will develop an understanding of measurement error, and develop the skills to aggregate, interpret, and present the data and resulting conclusions. Equipment and supplies will be provided to enhance these hands-on experiences for students. A minimum of 20% of classroom time will be dedicated to laboratory experiences.

Florida Standards			Correlation to CTE Program Standard #
36.0	Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Aerospace Technologies.		
	36.01 Key Ideas and Details		
	36.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. LAFS.1112.RST.1.1	
	36.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.1112.RST.1.2	
	36.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.1112.RST.1.3	
	36.02 Craft and Structure		
	36.02.1	Determine the meaning of symbols key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. LAFS.1112.RST.2.4	

Florida Standards			Correlation to CTE Program Standard #
	36.02.2	Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. LAFS.1112.RST.2.5	
	36.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. LAFS.1112.RST.2.6	
36.03	Integration of Knowledge and Ideas		
	36.03.1	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g. quantitative data, video, multimedia) in order to address a question or solve a problem. LAFS.1112.RST.3.7	
	36.03.2	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. LAFS.1112.RST.3.8	
	36.03.3	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. LAFS.1112.RST.3.9	
36.04	Range of Reading and Level of Text Complexity		
	36.04.1	By the end of grade 11, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	36.04.2	By the end of grade 12, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 11–CCR text complexity band independently and proficiently. LAFS.1112.RST.4.10	
37.0	Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Aerospace Technologies.		
37.01	Text Types and Purposes		
	37.01.1	Write arguments focused on discipline-specific content. LAFS.1112.WHST.1.1	
	37.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.1112.WHST.1.2	

Florida Standards			Correlation to CTE Program Standard #
	37.02	Production and Distribution of Writing	
	37.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.1112.WHST.2.4	
	37.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.1112.WHST.2.5	
	37.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. LAFS.1112.WHST.2.6	
	37.03	Research to Build and Present Knowledge	
	37.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.1112.WHST.3.7	
	37.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. LAFS.1112.WHST.3.8	
	37.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.1112.WHST.3.9	
	37.04	Range of Writing	
	37.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.1112.WHST.4.10	
38.0	Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Aerospace Technologies.		

Florida Standards	Correlation to CTE Program Standard #
38.01 Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	
38.02 Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
38.03 Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
38.04 Model with mathematics. MAFS.K12.MP.4.1	
38.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
38.06 Attend to precision. MAFS.K12.MP.6.1	
38.07 Look for and make use of structure. MAFS.K12.MP.7.1	
38.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
04.0	Demonstrate an understanding of the characteristics and scope of technology. – The student will be able to:		SC.912.N.1.1
04.01	Discuss the nature and development of technological knowledge and processes.	LAFS.1112.RI.2.4	
04.02	Explain the rapid increase in the rate of technological development and diffusion.	LAFS.1112.W.1.2	
04.03	Conduct specific goal-directed research related to inventions and innovations.	LAFS.1112.W.3.7 MAFS.912.S-IC.2.6	
05.0	Demonstrate an understanding of the core concepts of technology. – The student will be able to:		SC.912.N.1.1, 3, 4, 7
05.01	Apply systems thinking logic and creativity with appropriate compromises in complex real-life problems.	LAFS.1112.SL.1.1	
05.02	Assess technological systems, which are the building blocks of technology and are embedded within larger technological, social, and environmental systems.	LAFS.1112.SL.1.1	
05.03	Assess the stability of a technological system and its influence by all of the components in the system, especially those in the feedback loop.	LAFS.1112. SL.1.1 LAFS.1112.W.1.2	

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
05.04	Compare resources involving trade-offs between competing values, such as availability, cost, desirability, and waste.	LAFS.1112.RI.1.1, 2	
05.05	Identify the criteria and constraints of a product or system and determine how they affect the final design and development.	LAFS.1112.RI.1.1, 2	
05.06	Identify new technologies that create new processes.	LAFS.1112.RI.1.1, 2	
05.07	Propose a quality control process to ensure that a product, service or system meets established criteria.	LAFS.1112.RI.1.1, 2 LAFS.1112.W.1.2	
05.08	Organize a management system as the process of planning, organizing, and controlling work.		
05.09	Outline complex systems that have many layers of controls and feedback loops to provide information.		
06.0	Demonstrate an understanding of the relationships among technologies and the connection between technology and other fields of study. – The student will be able to:		SC.912.N.1.1, 4, 5
06.01	Discuss technology transfer occurring when a new user applies an existing innovation developed for one purpose in a different function.	LAFS.1112.SL.1.1 LAFS.1112.W.4.10	
06.02	Examine technological innovation resulting when ideas, knowledge, or skills are shared within a technology, among technologies, or across other fields.	LAFS.1112. SL.1.1 LAFS.1112.W.4.10	
06.03	Investigate technological progresses that promote the advancement of science and mathematics.	LAFS.1112. SL.1.1 LAFS.1112.W.4.10	
07.0	Demonstrate an understanding of the cultural, social, economic, and political effects of technology. – The student will be able to:		SC.912.N.4.2
07.01	Evaluate the use of technology involving weighing the trade-offs between the positive and the negative effects.	LAFS.1112.SL.1.1; 2.4 LAFS.1112.RI.3.8	
07.02	Discuss ethical considerations important in the development, selection, and use of technologies.	LAFS.1112.SL.1.1; 2.4 LAFS.1112.RI.3.8	
07.03	Debate the cultural, social, economic, and political changes caused by the transfer of a technology from one society to another.	LAFS.1112.SL.1.1	
08.0	Demonstrate an understanding of the effects of technology on the environment. – The student will be able to:		SC.912.L.17.16, 17, 20
08.01	Consider trade-offs of developing technologies to reduce the use of resources.	LAFS.1112.RI.1.1 LAFS.1112.W.1.1; 3.8 LAFS.1112.SL.1.2	
08.02	Assess technologies devised to reduce the negative consequences of other technologies.	LAFS.1112.RI.1.1 LAFS.1112.W.1.1;3.8 LAFS.1112.SL.1.2	

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
08.03	Make decisions about the implementation of technologies involving the weighing of trade-offs between predicted positive and negative effects on the environment.	LAFS.1112.RI.1.1 LAFS.1112.W.1.1; 3.8 LAFS.1112. SL.1.2	
09.0	Demonstrate an understanding of the role of society in the development and use of technology. – The student will be able to:		
09.01	Report how different cultures develop their own technologies to satisfy their individual and shared needs, wants, and values.		
09.02	Consider societal opinions and demands, as well as corporate cultures to use as a basis for deciding whether or not to develop a technology.		
09.03	Evaluate a number of different factors, such as advertising, the strength of the economy, the goals of a company, and the latest fads as contributors to shaping the design of and demand for various technologies.		
10.0	Demonstrate an understanding of the influence of technology on history. – The student will be able to:		SC.912.N.2.4; 3.2
10.01	Discuss how the evolution of civilization has been directly affected by, and has in turn affected, the development and use of tools and materials.	LAFS.1112.SL.1.1, 2; 2.4, 5, 6	
10.02	Research the history of technology as a powerful force in reshaping the social, cultural, political, and economic landscape.	LAFS.1112.SL.1.1, 2; 2.4, 5, 6 LAFS.1112. W.3.7, 8	
10.03	Debate that early in the history of technology, the development of many tools and machines was based not on scientific knowledge but on technological know-how.	LAFS.1112.SL.1.1, 2; 2.4, 5, 6	
11.0	Demonstrate an understanding of the attributes of design. – The student will be able to:		SC.912.N.1.1, 3, 4, 5, 6, 7; 3.3, 5; 4.2
11.01	Apply the design process; including defining a problem, brainstorming, researching and generating ideas, identifying criteria and specifying constraints, exploring possibilities, selecting an approach, developing a design proposal, making a model or prototype, testing and evaluating the design using specifications, refining the design, creating or making it, and communicating processes and results.		
11.02	Translate design problems that are seldom presented in a clearly defined form.		
11.03	Evaluate a design continually, and improve and revise the idea of the design as needed.		
11.04	Analyze competing requirements of a design, such as criteria, constraints, and efficiency.		
12.0	Demonstrate an understanding of engineering design. – The student will be able to:		SC.912.N.1.1, 3, 4, 5, 6, 7; 2.2; 3.3, 5; 4.2
12.01	Investigate design principles used to evaluate existing designs, to collect data, and to guide the design process.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
12.02	Examine the influence of personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly on the engineering design process.	MAFS.921.N-VM.1.1, 2, 3, 4, 5	
12.03	Construct a prototype or a working model used to test a design concept by making actual observations and necessary adjustments.		
12.04	Evaluate factors taken into account in the process of engineering.	MAFS.912.G-CO.1.1, 2	
13.0	Demonstrate an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving. – The student will be able to:		SC.912.N.1.1, 3, 4, 5, 6, 7; 2.1, 4, 5; 3.1, 3, 5; 4.2
13.01	Employ research and development as a specific problem solving approach that is used intensively in business and industry to prepare devices and systems for the marketplace.	LAFS.1112.W.2.4,5,6	
13.02	Conduct research needed to solve technological problems.	LAFS.1112.W.3.7	
13.03	Differentiate between technological and non-technological problems, and identify which problems can be solved using technology.		
13.04	Utilize a multidisciplinary approach to solving technological problems.		
14.0	Demonstrate the abilities to apply the design process. – The student will be able to:		SC.912.N.1.1, 3, 4, 5, 6, 7; 3.3, 5; 4.2
14.01	Interpret the design problem to solve and decide whether or not to address it.		
14.02	Evaluate criteria and constraints and determine how these will affect the design process.	MAFS.912.G-CO.1.1, 2	
14.03	Refine a design by using prototypes and modeling to ensure quality, efficiency, and productivity of the final product.		
14.04	Evaluate the design solution using conceptual, physical, and mathematical models at various intervals of the design process in order to check for proper design and to note areas where improvements are needed.		
14.05	Produce a product or system using a design process.	MAFS.912.G-CO.1.1, 2	
14.06	Evaluate final solutions and communicate observations, processes, and results of the entire design process, using verbal, graphic, quantitative, virtual, and written means, in addition to three-dimensional models.	LAFS.1112.W.1.1, 2 LAFS.1112.SL.2.4 MAFS.912.S-IC.1.6	
15.0	Demonstrate the abilities to use and maintain technological products and systems. – The student will be able to:		SC.912.N.1.1
15.01	Document processes and procedures and communicate them to different audiences using appropriate oral and written techniques.	LAFS.1112.W.1.2 LAFS.1112.SL.2.4	
15.02	Diagnose a system that is malfunctioning and use tools, materials, machines, and knowledge to repair it.	LAFS.1112.R.1.1	

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
15.03	Troubleshoot, analyze, and maintain systems to ensure safe and proper function and precision.	LAFS.1112.R.1.1	
15.04	Operate systems so that they function in the way they were designed.		
15.05	Use computers and calculators to access, retrieve, organize, process, maintain, interpret, and evaluate data and information in order to communicate.		
16.0	Demonstrate the abilities to assess the impact of products and systems. – The student will be able to:	MAFS.912.S-IC.2	SC.912.L.17.4, 16 SC.912.N.1.1, 4, 6
16.01	Collect information and evaluate its quality.	MAFS.912.S-IC.2.5	
16.02	Synthesize data, analyze trends, and draw conclusions regarding the effect of technology on the individual, society, and the environment.	MAFS.912.S-IC.2.6	
16.03	Apply assessment techniques, such as trend analysis and experimentation to make decisions about the future development of technology.	MAFS.912.S-IC.2.6	
16.04	Design forecasting techniques to evaluate the results of altering natural systems.		
17.0	Demonstrate an understanding of and be able to select and use energy and power technologies. – The student will be able to:		SC.912.P.10.1, 3
17.01	Discuss how energy cannot be created nor destroyed; however, it can be converted from one form to another.	LAFS.1112.SL.1.1	
17.02	Categorize types of energy into major forms: thermal, radiant, electrical, mechanical, chemical, nuclear, and others.		
17.03	Explain impossibility of building an engine to perform work that does not exhaust thermal energy to the surroundings.	LAFS.1112.SL.1.1 LAFS.1112.W.1.2	
17.04	Classify energy resources as renewable or nonrenewable.		
17.05	Construct a power system having a source of energy, a process, and loads.		
18.0	Demonstrate an understanding of and be able to select and use information and communication technologies. – The student will be able to:		
18.01	Discuss information and communication technologies including the inputs, processes, and outputs associated with sending and receiving information.	LAFS.1112.SL.1.1	
18.02	Classify information and communication systems that allow information to be transferred as human to human, human to machine, machine to human, or machine to machine.	LAFS.1112.RI.1.2	
18.03	Use information and communication systems to inform, persuade, entertain, control, manage, and educate.	LAFS.1112.RI.1.2	
18.04	Identify components of a communications system, including source, encoder, transmitter, receiver, decoder, storage, retrieval, and destination.		
18.05	Identify many ways to communicate information, such as graphic and electronic means.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
18.06	Communicate technological knowledge and processes using symbols, measurement, conventions, icons, graphic images, and languages that incorporate a variety of visual, auditory, and tactile stimuli.		
19.0	Demonstrate an understanding of and be able to select and use transportation technologies. – The student will be able to:		
19.01	Analyze the vital role played by transportation in the operation of other technologies, such as manufacturing, construction, communication, health and safety, and agriculture.	LAFS.1112.RI.1.1	
19.02	Define intermodalism as the use of different modes of transportation, such as highways, railways, and waterways as part of an interconnected system that can move people and goods easily from one mode to another.	LAFS.1112.RI.1.2 LAFS.1112.L.3.6	
19.03	Discuss how transportation services and methods have led to a population that is regularly on the move.	LAFS.1112.SL.1.1	
19.04	Identify processes and innovative techniques involved in the design of intelligent and non-intelligent transportation systems.	LAFS.1112.RI.1.2	
20.0	Demonstrate safe and appropriate use of tools and machines in aviation/aerospace technologies. – The student will be able to:		
20.01	Select appropriate tools, procedures, and/or equipment.		
20.02	Demonstrate the safe usage of appropriate tools, procedures, and operation of equipment.		
20.03	Maintain and troubleshoot equipment used in a variety of technological systems.		
20.04	Follow laboratory safety rules and procedures.	LAFS.1112.RI.1.2	
20.05	Demonstrate good housekeeping at workstation within total laboratory.		
20.06	Identify color-coding safety standards.		
20.07	Explain fire prevention and safety precautions and practices for extinguishing fires.		
20.08	Identify harmful effects/potential dangers of familiar hazardous substances/devices to people and the environment.		
22.0	Describe the aviation/aerospace environment. – The student will be able to:		SC.912.E.5.4, 6; 7.3, 4, 5, 6 SC.912.L.17.4; 18.12 SC.912.P.12.2, 3, 7
22.01	Identify atmospheric regions and elements.		
22.02	Describe the roles of water and particulate matter in the atmosphere.	LAFS.1112.SL.2.4	
22.03	Describe and identify the elements of the atmosphere in motion.	LAFS.1112.SL.2.4	

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
22.04	Explain the role weather forecasting has as it relates to Aerospace Technologies.	LAFS.1112.W.1.2 MAFS.912.N-VM.2.4, 5	
22.05	Demonstrate an understanding of the principal bodies of the universe.		
22.06	Utilize astronomical principles, and technology to study the solar systems.		
22.07	Develop a radio telemetry system to measure temperature, pressure, humidity, or acceleration during a rocket flight.		
22.08	Define interplanetary space.	LAFS.1112.L.3.6	
22.09	Describe the physical properties of interplanetary space including the structure, formation, forces, and bodies.	LAFS.1112.SL.2.4, 5	
22.10	Describe interstellar and intergalactic space.	LAFS.1112.SL.2.4, 5	
23.0	Describe and demonstrate an understanding of the principles of flight. – The student will be able to:		SC.912.P.10.1, 7; 12.2, 3
23.01	Define terminology associated with flight and flight principles.	LAFS.1112.L.3.6	
23.02	Identify the structural components of aircraft.	LAFS.1112.SL.1.1	
23.03	Construct and test flying models of lighter-than-air craft.		
23.04	Demonstrate an understanding of a powered aircraft and the use of control surfaces to control flight characteristics of pitch, yaw and roll.		
23.05	Demonstrate an understanding of rocketry design and systems.		
23.06	Develop and construct models to test flight characteristics of powered aircraft.		
23.07	Explain the application of Newton's laws to flight and rocketry.	LAFS.1112.W.1.2 LAFS.1112.SL.1.1	
24.0	Demonstrate an understanding of electrical, mechanical, fluid, and pneumatic systems that could be used on/in aviation/aerospace environments. – The student will be able to:		SC.912.P.10.1, 3; 12.2, 3
24.01	Demonstrate the concepts of force, work, rate, resistance, energy and power through the use of various mechanical sub systems, include: gears, belts, valves, chains, pulleys, screws, cams, linkages, rods, and sprockets or mechanical trainers.	MAFS.912.A-CED.1.4	
24.02	Demonstrate the concepts of force, work rate, resistance, and power through the use of various fluid subsystems, including: fluid manometers, hydraulic lifts, pipes, valves, tanks, air gauges of hydraulic trainers, and pneumatic trainers.	MAFS.912.A-CED.1.4	
24.03	Demonstrate the concepts of force, work, rate, resistance, energy, and power through the use of various electrical sub system, including: conductors, control elements, electrical loads, voltage sources, current sources, circuits, components, and measurement equipment, or electrical/electronic trainers.	MAFS.912.A-CED.1.4	

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
26.0	Demonstrate technical knowledge of computer control as it is related to aviation/aerospace projects. – The student will be able to:		SC.912.N.1.1, 3, 4, 5, 6, 7; 3.3, 5; 4.2
26.01	Demonstrate the application of a computer and software program to develop a plan for an aerospace vehicle.		
26.02	Demonstrate an ability to perform a milling, engraving or turning operation utilizing a computer assisted manufacturing program.		
26.03	Demonstrate problem-solving skills relative to computer assisted manufacturing related to the aerospace industry.		
26.04	Demonstrate an ability to develop programs to control flight operations and/or testing procedures.		
27.0	Demonstrate knowledge of robotics as it relates to the aviation/aerospace industry. – The student will be able to:		SC.912.N.1.1, 3, 4, 5, 6, 7; 3.3, 5; 4.2
27.01	Identify different types of robots.	LAFS.1112.RI.1.1, 2	
27.02	State the function of effectors, sensors, controllers, and auxiliary parts in robotics system.		
27.03	Program a robot using a computer to perform a specific task.		
27.04	Explain how robotics technology is used in the space program.		
27.05	Demonstrate problem-solving skills using robotics technology as it applies to Aerospace Technologies experiments and programs.		
27.06	Forecast how robotics technology will be used in the exploration of space, space colonization or interplanetary space travel.		
28.0	Demonstrate knowledge and understanding of processing skills on materials and composites as they relate to aviation/aerospace technologies. – The student will be able to:		
28.01	Identify tools, machines and equipment in the laboratory and explain their functions.	LAFS.1112.RI.1.1, 2	
28.02	Select appropriate tools, machines and equipment to accomplish a given task.		
28.03	Demonstrate safe and correct use of tools, machines and equipment.		
28.04	Identify various industrial raw materials.	LAFS.1112.RI.1.1	
28.05	Perform processing skills on materials and composites as needed to develop aerospace vehicles, models, experimental fixtures, and apparatus.		
29.0	Describe and demonstrate principles of navigation. – The student will be able to:	MAFS.912.S-IC.2	SC.912.E.5.5, 10, 11 SC.912.P.12.1, 7, 9
29.01	Describe navigation principles as they relate to aeronautical travel.		
29.02	Demonstrate and ability to read and use an aeronautical navigational chart.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
29.03	Examine navigational technologies and systems as they relate to aeronautical systems.		
29.04	Complete a flight plan for a fixed wing aircraft, from destination to destination.		
29.05	Demonstrate an understanding and application of mathematical concepts as they relate to determining space flight mechanics.		
29.06	Demonstrate an ability to compute a space flight orbit.		
29.07	Define and describe a variety of orbital patterns.		
30.0	Explore the role of civilian spacecraft in the exploration and colonization of space. – The student will be able to:		SC.912.E.5.6,7,10,11
30.01	Participate in the development of a study for a model of manned interplanetary space travel.	LAFS.1112.RI.1.2	
30.02	Develop a plan for scientific research to be performed on a space station facility.		
30.03	Develop a plan for flight crew training for a manned space flight.		
30.04	Research, develop, plan, and build model structures of space colonization structures.	LAFS.1112.W.3.7 MAFS.912.G-CO.1.1, 2 MAFS.912.S-IC.2.6	
30.05	Develop plans, models and a visual presentation of a manned space flight to a distant planet in the solar system.	LAFS.1112.W.3.8 MAFS.912.G-CO.1.1, 2 MAFS.912.S-IC.2.6	
30.06	Examine methods of sending and receiving messages and controlling telemetry from space.		
32.0	Demonstrate appropriate skills in analyzing and evaluating technological advancements as reported by the media. – The student will be able to:		
32.01	Distinguish between verifying facts and claims.		
32.02	Determine reliability and accuracy of sources.		
32.03	Identify stated and unstated assumptions.		
32.04	Recognizing logical inconsistencies and biases.		
34.0	Perform advanced study and technical skills related to aerospace technologies. – The student will be able to:		SC.912.N.1.1, 3, 4, 5, 6, 7; 3.3, 5; 4.2
34.01	Identify an aerospace problem or product for improvement using the design methodology.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	34.02 Develop a written plan of work for the design team to carry out the project.	LAFS.1112.W.1.2	
	34.03 Show evidence of technical study in support of the project.	LAFS.1112.W.1.1	
	34.04 Perform skills related to the aerospace project.	MAFS.912.S-IC.2.5,6 MAFS.912.N-VM.1.1, 2, 3, 4, 5; 2.4, 5 MAFS.912.G-CO.1.1, 2 MAFS.912.S-FC.1.6 MAFS.912.A-CED.1.4 MAFS.912.F-TF.1.3; 2.7, 5	
	34.05 Complete the project as planned.		
	34.06 Deliver a professional quality presentation of the design process and solution.	LAFS.1112.SL.2.4, 5, 6	
35.0	Demonstrate an understanding of career opportunities and requirements in the field of aerospace technologies. – The student will be able to:		
	35.01 Discuss individual interests related to a career in Aerospace Technologies.	LAFS.1112.SL.1.1	
	35.02 Explore career opportunities related to Aerospace Technologies.	LAFS.1112.W.3.7, 8	
	35.03 Explore secondary education opportunities related to Aerospace Technologies.	LAFS.1112.W.3.7, 8	
	35.04 Conduct a job search.		
	35.05 Complete a job application form correctly.	LAFS.1112.L.1.2; 2.3 LAFS.1112.W4.10	
	35.06 Demonstrate competence in job interview techniques.	LAFS.1112.SL.2.6	
	35.07 Create a professional resume and letter of introduction.		
	35.08 Solicit awards, letters of recommendation and recognition.		
	35.09 Organize work samples in a professional, presentable format.		

Additional Information

Laboratory Activities

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

Career and Technical Student Organization (CTSO)

The Florida Technology Student Association (FL-TSA) is the intercurricular career and technical student organization for providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

Cooperative Training – OJT

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

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 Occupational Completion Point (OCP) or a Modified Occupational Completion Point (MOCP). If needed, a student may enroll in the same career and technical course more than once. Documentation should be included in the IEP that clearly indicates that it is anticipated that the student may need an additional year to complete an OCP/MOCP. The student should work on different competencies and new applications of competencies each year toward completion of the OCP/MOCP. After achieving the competencies identified for the year, the student earns credit for the course. It is important to ensure that credits earned by students are reported accurately. The district's information system must be designed to accept multiple credits for the same course number for eligible students with disabilities.

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

Florida Department of Education
Curriculum Framework

Program Title: **Technology Studies**
Program Type: **Non Career Preparatory**
Career Cluster: **Engineering & Technology Education**

Secondary – Non Career Preparatory	
Program Number	8600100
CIP Number	0821010100
Grade Level	9-12; 30, 31
Standard Length	3 credits
Teacher Certification	TEC ED 1 @2 ENG @7 7G
CTSO	Florida Technology Student Association (FL-TSA)
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This program provides a student with a foundation in the role of technology in everyday life along with a broad range of technology skills that make them aware of technology around them. Students completing the program will become technologically literate by learning the concepts and role that engineering, design, invention, and innovation have in creating technology systems that help make life easier and better. Students learn that technology must be evaluated to determine the positive and negative effects, and how these have shaped today's global society. The key component of the program is that students become knowledgeable about technology, and use hands-on lessons to apply and transfer this knowledge to common problems.

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 one-credit courses. The following table illustrates the program structure:

Course Number	Course Title	Length	Level	Graduation Requirement
8600510	Technology Studies I	1 credit	2	PA
8600610	Technology Studies II	1 credit	2	PA
8601710	Technology Studies III	1 credit	2	PA

(Graduation Requirement Abbreviations- EQ= Equally Rigorous Science, PA= Practical Arts, EC= Economics, VO= Career and Technical Education)

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.

Academic Alignment Table

Academic alignment is an ongoing, collaborative effort of professional educators specializing in the fields of science, mathematics, English/language arts, and Career and Technical Education (CTE). This initiative supports CTE programs by improving student performance through the integration of academic content within CTE courses. Career and Technical Education courses that have been aligned to the Next Generation Sunshine State Standards for Science and the Florida Standards for Mathematics and English/Language Arts will show the following data: the quantity of academic standards in the CTE course; the total number of standards contained in the academic course; and the percentage of alignment to the CTE course.

Courses	Anatomy/ Physiology Honors	Astronomy Solar/Galactic Honors	Biology 1	Chemistry 1	Earth-Space Science	Environmental Science	Genetics	Integrated Science	Marine Science 1 Honors	Physical Science	Physics 1
8600510	**	**	**	**	**	**	**	**	**	**	**
8600610	**	**	**	**	**	**	**	**	**	**	**
8601710	**	**	**	**	**	**	**	**	**	**	**

** *Alignment pending review* # *Alignment attempted, but no correlation to academic course*

Courses	Algebra 1	Algebra 2	Geometry	English 1	English 2	English 3	English 4
8600510	**	**	**	**	**	**	**
8600610	**	**	**	**	**	**	**
8601710	**	**	**	**	**	**	**

** *Alignment pending review* # *Alignment attempted, but no correlation to academic course*

Florida Standards for Technical Subjects

Florida Standards (FS) for English Language Arts and Literacy in History/Social Studies, Science, and Technical Subjects are the critical reading and writing literacy standards designed for grade 6 and above. These standards are predicated on teachers of history/social studies, science, and technical subjects using their content area expertise to help students meet the particular challenges of reading, writing, speaking, listening, and language in their respective fields. It is important to note that the 6-12 literacy standards in history/social studies, science, and technical subjects are not meant to replace content standards in those areas but rather to supplement them.

This curriculum framework incorporates the grades 9-10 reading and writing literacy standards in the first two courses of this CTE program and grade 11-12 reading and writing literacy standards in the third and fourth courses of this CTE program. The standards for Mathematical Practices describe varieties of expertise that educators at all levels should seek to develop in their students. These practices rest on important "processes and proficiencies" with longstanding importance in mathematics education. This curriculum framework incorporates the appropriate mathematical practices in the first four courses of this CTE program.

National Standards

Programs and/or courses identified as having Industry or National Standards have been crosswalked with the corresponding standards and/or benchmarks. Industry or National Standards for the Technology Studies program can be found using the following link:

http://www.iteea.org/TAA/PDFs/xstnd.pdf

Common Career Technical Core – Career Ready Practices

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

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

2. Apply appropriate academic and technical skills.

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

4. Communicate clearly, effectively and with reason.

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

6. Demonstrate creativity and innovation.

7. Employ valid and reliable research strategies.

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

9. Model integrity, ethical leadership and effective management.

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

11. Use technology to enhance productivity.

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

Standards

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

01.0 Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Technology Studies.
02.0 Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Technology Studies.
03.0 Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Technology Studies.
04.0 Demonstrate an understanding of the characteristics and scope of technology.
05.0 Demonstrate an understanding of the core concepts of technology.
06.0 Demonstrate an understanding of the relationships among technologies and the connection between technology and other fields of study. .
07.0 Demonstrate an understanding of the cultural, social, economic, and political effects of technology.
08.0 Demonstrate an understanding of the effects of technology on the environment.
09.0 Demonstrate an understanding of the role of society in the development and use of technology.
10.0 Demonstrate an understanding of the influence of technology on history.
11.0 Demonstrate an understanding of the attributes of design.
12.0 Demonstrate an understanding of engineering design.
13.0 Demonstrate an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving.
14.0 Demonstrate the abilities to apply the design process.
15.0 Demonstrate the abilities to use and maintain technological products and systems.
16.0 Demonstrate the abilities to assess the impact of products and systems.
17.0 Demonstrate an understanding of and be able to select and use medical technologies.
18.0 Demonstrate an understanding of and be able to select and use agricultural and related biotechnologies.
19.0 Demonstrate an understanding of and be able to select and use energy and power technologies.
20.0 Demonstrate an understanding of and be able to select and use information and communication technologies.
21.0 Demonstrate an understanding of and be able to select and use transportation technologies.
22.0 Demonstrate an understanding of and be able to select and use manufacturing technologies.
23.0 Demonstrate an understanding of and be able to select and use construction technologies.
24.0 Demonstrate the ability to work safely with a variety of technologies.
25.0 Demonstrate interpersonal skills as they relate to the workplace.
26.0 Identify and apply methods of information acquisition and utilizations.
27.0 Apply basic skills in communications, mathematics, and science appropriate to technological content and learning activities.
28.0 Demonstrate and apply design/problem-solving processes.
29.0 Express an understanding of technological systems and their complex interrelationships.
30.0 Demonstrate the ability to properly identify, organize, plan, and allocate resources.
31.0 Discuss individual interests and aptitudes as they relate to a career.
32.0 Demonstrate employability skills.
33.0 Demonstrate an understanding of entrepreneurship.
34.0 Make an informed and meaningful career choice.

35.0 Identify evolving technologies in our technological world.
36.0 Demonstrate knowledge of the basic principles of technology, the basic elements of all systems, and the components of each basic element.
37.0 Demonstrate knowledge and perform special skills unique to the physical technologies.
38.0 Demonstrate knowledge and perform special skills unique to the information/communication technologies.
39.0 Demonstrate knowledge and perform special skills unique to the biotechnologies.
40.0 Demonstrate knowledge and application of robotics technology.
41.0 Demonstrate knowledge and application of programmable controller technology.
42.0 Demonstrate knowledge and application of computer numerical control technology.
43.0 Demonstrate knowledge and application of computer-aided drafting technology.
44.0 Demonstrate knowledge and application of laser technology.
45.0 Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Technology Studies.
46.0 Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Technology Studies.
47.0 Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Technology Studies.
48.0 Demonstrate knowledge and application of mechanical systems.
49.0 Demonstrate knowledge and application of fluid systems.
50.0 Demonstrate knowledge and application of electrical systems.
51.0 Demonstrate the use of fiber optics.
52.0 Demonstrate the use of a computer to integrate and control a system composed of mechanical, fluid and electrical systems.
53.0 Conduct a research and experimentation project on a technological material or process.

Florida Department of Education
Student Performance Standards

Course Title: **Technology Studies I**
Course Number: **8600510**
Course Credit: **1**

Course Description:
This course provides students with an introduction to the knowledge, human relations, and technological skills found today in technical professions.

Florida Standards			Correlation to CTE Program Standard #
01.0	Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Technology Studies.		
	01.01 Key Ideas and Details		
	01.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. LAFS.910.RST.1.1	
	01.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.910.RST.1.2	
	01.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.910.RST.1.3	
	01.02 Craft and Structure		
	01.02.1	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. LAFS.910.RST.2.4	
	01.02.2	Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). LAFS.910.RST.2.5	
	01.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. LAFS.910.RST.2.6	

Florida Standards			Correlation to CTE Program Standard #
	01.03	Integration of Knowledge and Ideas	
	01.03.1	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. LAFS.910.RST.3.7	
	01.03.2	Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. LAFS.910.RST.3.8	
	01.03.3	Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. LAFS.910.RST.3.9	
	01.04	Range of Reading and Level of Text Complexity	
	01.04.1	By the end of grade 9, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	01.04.2	By the end of grade 10, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 9–10 text complexity band independently and proficiently. LAFS.910.RST.4.10	
02.0	Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Technology Studies.		
	02.01	Text Types and Purposes	
	02.01.1	Write arguments focused on discipline-specific content. LAFS.910.WHST.1.1	
	02.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.910.WHST.1.2	
	02.02	Production and Distribution of Writing	
	02.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.910.WHST.2.4	
	02.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.910.WHST.2.5	

Florida Standards			Correlation to CTE Program Standard #
	02.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. LAFS.910.WHST.2.6	
02.03	Research to Build and Present Knowledge		
	02.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.910.WHST.3.7	
	02.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. LAFS.910.WHST.3.8	
	02.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.910.WHST.3.9	
02.04	Range of Writing		
	02.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.910.WHST.4.10	
03.0	Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Technology Studies.		
03.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1		
03.02	Reason abstractly and quantitatively. MAFS.K12.MP.2.1		
03.03	Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1		
03.04	Model with mathematics. MAFS.K12.MP.4.1		
03.05	Use appropriate tools strategically. MAFS.K12.MP.5.1		

Florida Standards	Correlation to CTE Program Standard #
03.06 Attend to precision. MAFS.K12.MP.6.1	
03.07 Look for and make use of structure. MAFS.K12.MP.7.1	
03.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci	National Standards
04.0 Demonstrate an understanding of the characteristics and scope of technology. – The student will be able to:			
04.01 Discuss the nature and development of technological knowledge and processes.			STL.1.J
04.02 Explain the rapid increase in the rate of technological development and diffusion.			STL.1.K
04.03 Conduct specific goal-directed research related to inventions and innovations.			STL.1.L
04.04 Discuss current technological developments that are/were driven by profit motive and the market.			STL.1.M
05.0 Demonstrate an understanding of the core concepts of technology. – The student will be able to:			
05.01 Identify systems thinking logic and creativity with appropriate compromises in complex real-life problems.			
05.02 Define technological systems, which are the building blocks of technology and are embedded within larger technological, social, and environmental systems.			
05.03 Identify the stability of a technological system and its influence by all of the components in the system, especially those in the feedback loop.			
05.04 Identify resources involving trade-offs between competing values, such as availability, cost, desirability, and waste.			
05.05 Identify the criteria and constraints of a product or system and then determine how they affect the final design and development.			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
05.06	List strategies for optimizing a technological process or methodology of designing or making a product, dependent on criteria and constraints.			
05.07	Identify new technologies that create new processes.			
05.08	Describe a quality control process to ensure that a product, service or system meets established criteria.			
05.09	Define a management system as the process of planning, organizing, and controlling work.			
05.10	Outline complex systems that have many layers of controls and feedback loops to provide information.			
06.0	Demonstrate an understanding of the relationships among technologies and the connection between technology and other fields of study. – The student will be able to:			
06.01	Identify technology transfer occurring when a new user applies an existing innovation developed for one purpose in a different function.			
06.02	Identify technological innovation resulting when ideas, knowledge, or skills are shared within a technology, among technologies, or across other fields.			
06.03	Outline the process of patenting to protect a technological idea.			
06.04	Identify technological progresses that promote the advancement of science and mathematics.			
07.0	Demonstrate an understanding of the cultural, social, economic, and political effects of technology. – The student will be able to:			
07.01	Identify changes caused by the use of technology ranging from gradual to rapid and from subtle to obvious.			
07.02	Classify the use of technology involving weighing the trade-offs between the positive and the negative effects.			
07.03	Identify ethical considerations important in the development, selection, and use of technologies.			
07.04	List the cultural, social, economic, and political changes caused by the transfer of a technology from one society to another.			
08.0	Demonstrate an understanding of the effects of technology on the environment. – The student will be able to:			
08.01	Select technologies to conserve water, soil, and energy through such techniques as reusing, reducing and recycling.			
08.02	List trade-offs of developing technologies to reduce the use of resources.			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
08.03	Identify technology to monitor the environment and provide information as a basis for decision-making.			
08.04	Compare and contrast the alignment of technological processes with natural processes to maximize performance and reduce negative impacts on the environment.			
08.05	Identify technologies devised to reduce the negative consequences of other technologies.			
08.06	Discuss the implementation of technologies involving the weighing of trade-offs between predicted positive and negative effects on the environment.			
09.0	Demonstrate an understanding of the role of society in the development and use of technology. – The student will be able to:			
09.01	Investigate how different cultures develop their own technologies to satisfy their individual and shared needs, wants, and values.			
09.02	Collect societal opinions and demands, as well as corporate cultures to use as a basis for deciding whether or not to develop a technology.			
09.03	Identify a number of different factors, such as advertising, the strength of the economy, the goals of a company, and the latest fads as contributors to shaping the design of and demand for various technologies.			
10.0	Demonstrate an understanding of the influence of technology on history. – The student will be able to:			
10.01	Research how the evolution of civilization has been directly affected by, and has in turn affected, the development and use of tools and materials.			
10.02	Define the history of technology as a powerful force in reshaping the social, cultural, political, and economic landscape.			
10.03	Discuss that early in the history of technology, the development of many tools and machines was based not on scientific knowledge but on technological know-how.			
10.04	Define the Iron Age as the use of iron and steel as the primary materials for tools.			
10.05	Define the Middle Ages and its development of many technological devices that produced long-lasting effects on technology and society.			
10.06	Define the Renaissance, a time of rebirth of the arts and humanities, as an important development in the history of technology.			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
	10.07 Define the Industrial Revolution and the development of continuous manufacturing, sophisticated transportation and communication systems, advanced construction practices, and improved education and leisure time.			
	10.08 Define the Information Age and its placement of emphasis on the processing and exchange of information.			
11.0	Demonstrate an understanding of the attributes of design. – The student will be able to:			
	11.01 Recognize the design process; including defining a problem, brainstorming, researching and generating ideas, identifying criteria and specifying constraints, exploring possibilities, selecting an approach, developing a design proposal, making a model or prototype, testing and evaluating the design using specifications, refining the design, creating or making it, and communicating processes and results.			
	11.02 Restate design problems that are seldom presented in a clearly defined form.			
	11.03 Check and critique a design continually, and improve and revise the idea of the design as needed.			
	11.04 List competing requirements of a design, such as criteria, constraints, and efficiency.			
12.0	Demonstrate an understanding of engineering design. – The student will be able to:			
	12.01 Identify design principles used to evaluate existing designs, to collect data, and to guide the design process.			
	12.02 Describe the influence of personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly on the Engineering Design process.			
	12.03 Construct a prototype or a working model used to test a design concept by making actual observations and necessary adjustments.			
	12.04 Identify factors taken into account in the process of engineering.			
13.0	Demonstrate an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving. – The student will be able to:			
	13.01 Define research and development as a specific problem solving approach that is used intensively in business and industry to prepare devices and systems for the marketplace.			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
13.02	Identify research needed to solve technological problems.			
13.03	Differentiate between technological and non-technological problems, and identify which problems can be solved using technology.			
13.04	Utilize a multidisciplinary approach to solving technological problems.			
14.0	Demonstrate the abilities to apply the design process. – The student will be able to:			
14.01	Identify the design problem to solve and decide whether or not to address it.			
14.02	List criteria and constraints and determine how these will affect the design process.			
14.03	Refine a design by using prototypes and modeling to ensure quality, efficiency, and productivity of the final product.			
14.04	Evaluate the design solution using conceptual, physical, and mathematical models at various intervals of the design process in order to check for proper design and to note areas where improvements are needed.			
14.05	Develop a product or system using a design process.			
14.06	Evaluate final solutions and communicate observations, processes, and results of the entire design process, using verbal, graphic, quantitative, virtual, and written means, in addition to three-dimensional models.			
15.0	Demonstrate the abilities to use and maintain technological products and systems. – The student will be able to:			
15.01	Document processes and procedures and communicate them to different audiences using appropriate oral and written techniques.			
15.02	Diagnose a system that is malfunctioning and use tools, materials, machines, and knowledge to repair it.			
15.03	Troubleshoot, analyze, and maintain systems to ensure safe and proper function and precision.			
15.04	Operate systems so that they function in the way they were designed.			
15.05	Use computers and calculators to access, retrieve, organize, process, maintain, interpret, and evaluate data and information in order to communicate.			
16.0	Demonstrate the abilities to assess the impact of products and systems. – The student will be able to:			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
16.01	Collect information and evaluate its quality.			
16.02	Synthesize data, analyze trends, and draw conclusions regarding the effect of technology on the individual, society, and the environment.			
16.03	Define assessment techniques, such as trend analysis and experimentation to make decisions about the future development of technology.			
16.04	Identify forecasting techniques to evaluate the results of altering natural systems.			
17.0	Demonstrate an understanding of and be able to select and use medical technologies. – The student will be able to:			
17.01	Classify medical technologies including prevention and rehabilitation, vaccines and pharmaceuticals, medical and surgical procedures, genetic engineering, and the systems within which health is protected and maintained.			
17.02	Discuss telemedicine and its convergence of technological advances in a number of fields, including medicine, virtual presence, computer engineering, informatics, artificial intelligence, robotics, materials science, and perceptual psychology.			
17.03	Explain how the sciences of biochemistry and molecular biology have made it possible to manipulate the genetic information found in living creatures.			
18.0	Demonstrate an understanding of and be able to select and use agricultural and related biotechnologies. – The student will be able to:			
18.01	Define agriculture, including a combination of businesses that use a wide array of products and systems to produce, process, and distribute food, fiber, fuel, chemical, and other useful products.			
18.02	Identify biotechnology applications in such areas as agriculture, pharmaceuticals, food and beverages, medicine, energy, the environment, and genetic engineering.			
18.03	Define conservation as the process of controlling soil erosion, reducing sediment in waterways, and improving water quality.			
18.04	Apply engineering design processes to management of agricultural systems requiring knowledge of artificial ecosystems and the effects of technological development on flora and fauna.			
19.0	Demonstrate an understanding of and be able to select and use energy and power technologies. – The student will be able to:			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
19.01	Discuss how energy cannot be created nor destroyed; however, it can be converted from one form to another.			
19.02	Categorize types of energy into major forms: thermal, radiant, electrical, mechanical, chemical, nuclear, and others.			
19.03	Explain impossibility of building an engine to perform work that does not exhaust thermal energy to the surroundings.			
19.04	Classify energy resources as renewable or nonrenewable.			
19.05	Construct a power system having a source of energy, a process, and loads.			
20.0	Demonstrate an understanding of and be able to select and use information and communication technologies. – The student will be able to:			
20.01	Discuss information and communication technologies including the inputs, processes, and outputs associated with sending and receiving information.			
20.02	Classify information and communication systems that allow information to be transferred as human to human, human to machine, machine to human, or machine to machine.			
20.03	Use information and communication systems to inform, persuade, entertain, control, manage, and educate.			
20.04	Identify components of a communications system, including source, encoder, transmitter, receiver, decoder, storage, retrieval, and destination.			
20.05	Identify many ways to communicate information, such as graphic and electronic means.			
20.06	Communicate technological knowledge and processes using symbols, measurement, conventions, icons, graphic images, and languages that incorporate a variety of visual, auditory, and tactile stimuli.			
21.0	Demonstrate an understanding of and be able to select and use transportation technologies. – The student will be able to:			
21.01	Analyze the vital role played by transportation in the operation of other technologies, such as manufacturing, construction, communication, health and safety, and agriculture.			
21.02	Define intermodalism as the use of different modes of transportation, such as highways, railways, and waterways as part of an interconnected system that can move people and goods easily from one mode to another.			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
21.03	Discuss how transportation services and methods have led to a population that is regularly on the move.			
21.04	Identify processes and innovative techniques involved in the design of intelligent and non-intelligent transportation systems.			
22.0	Demonstrate an understanding of and be able to select and use manufacturing technologies. – The student will be able to:			
22.01	Service products to keep them in good operating condition.			
22.02	Classify materials based on their qualities as natural, synthetic, or mixed.			
22.03	Classify goods as durable goods designed to operate for a long period of time, or non-durable goods designed to operate for a short period of time.			
22.04	Identify and classify manufacturing systems into types, such as customized production, batch production, and continuous production.			
22.05	Discuss the interchangeability of parts to increase the effectiveness of manufacturing processes.			
22.06	Identify chemical technologies providing a means for humans to alter or modify materials and to produce chemical products.			
22.07	Employ marketing techniques involving establishing a product's identity, conducting research on its potential, advertising it, distributing it, and selling it.			
23.0	Demonstrate an understanding of and be able to select and use construction technologies. – The student will be able to:			
23.01	Define infrastructure as the underlying base or basic framework of a system.			STL.20.J
23.02	Identify a variety of processes and procedures used in constructing structures.			STL.20.K
23.03	Identify requirements involved in the design of structures.			STL.20.L
23.04	Recommend maintenance, alterations, or renovations to improve a structure or alter its intended use.			STL.20.M
23.05	Identify prefabricated materials used in some structures.			STL.20.N
24.0	Demonstrate the ability to work safely with a variety of technologies. – The student will be able to:			
24.01	Select appropriate tools, procedures, and/or equipment needed to produce a product.			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
24.02	Demonstrate the safe usage of appropriate tools, procedures, and operation of equipment needed to produce a product.			
24.03	Demonstrate knowledge required to maintain and troubleshoot equipment used in a variety of technological systems.			
24.04	Follow laboratory safety rules and procedures.			
24.05	Demonstrate good housekeeping at work station within total laboratory.			
24.06	Identify color-coding safety standards.			
24.07	Explain fire prevention and safety precautions and practices for extinguishing fires.			
24.08	Identify harmful effects/potential dangers of familiar hazardous substances/devices to people and the environment.			
25.0	Demonstrate interpersonal skills as they relate to the workplace. – The student will be able to:			
25.01	Perform roles in a student personnel system or in the Florida Technology Student Association (FL-TSA).			
25.02	Participate as a member of a team.			
25.03	Teach others new skills.			
25.04	Identify skills needed to serve clients/customers.			
25.05	Demonstrate leadership skills.			
25.06	Describe strategies necessary for negotiating agreements.			
25.07	Demonstrate the application of skills necessary to work with people of diverse backgrounds.			
25.08	Form an understanding and appreciation for work after listening to or observing technology workers.			
25.09	Form an understanding and appreciation for work after participating in a simulated technology group project in the laboratory.			
25.10	Form an understanding and appreciation for the roles and work of co-workers.			
26.0	Identify and apply methods of information acquisition and utilization. – The student will be able to:			
26.01	Define terms related to computers.			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
26.02	Identify and describe methods of information acquisition and evaluation.			
26.03	Discuss advantages and disadvantages in the application of technologies.			
26.04	Produce a plan to organize and maintain information relevant to emerging technologies.			
26.05	Comprehend and communicate information relevant to emerging technologies.			
26.06	Demonstrate the use of computers to process information.			
27.0	Apply basic skills in communications, mathematics, and science appropriate to technological content and learning activities. – The student will be able to:			
27.01	Identify and explain the main and subordinate ideas in a written work.			
27.02	Distinguish different purposes and methods of writing, identify a writer's point of view and tone, and interpret a writer's meaning.			
27.03	Define unfamiliar words by use of structural analysis, decoding, contextual clues, or by using a dictionary.			
27.04	Distinguish fact from opinion.			
27.05	Read critically by asking pertinent questions, by recognizing assumptions and implications, and by evaluating ideas.			
27.06	Select, relate, and organize, ideas using outlining and/or graphic organizers and develop the ideas in coherent paragraphs.			
27.07	Improve one's own writing by restructuring, correcting errors, and rewriting.			
27.08	Gather and organize information from primary and secondary sources; write a report using this research; quote, paraphrase, and summarize accurately; and cite sources properly.			
27.09	Vary one's writing style, including vocabulary and sentence structure, for different readers and purposes.			
27.10	Write logical and understandable statements, or phrases, to accurately fill out commonly used forms.			
27.11	Compose unified and coherent correspondence, directions, descriptions, explanations and reports.			
27.12	Participate critically and constructively in the exchange of ideas, particularly during class discussions and conferences with instructors.			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
27.13	Conceive and develop ideas about a topic for the purpose of speaking to a group; choose and organize related ideas; present them clearly in Standard English; and evaluate similar presentations by others.			
27.14	Use the mathematics of:			
	a) integers, fractions, and decimals;			
	b) ratios, proportions, and percentages;			
	c) roots and powers;			
	d) algebra;			
	e) geometry;			
27.15	Make estimates and approximations, and judge the reasonableness of a result.			
27.16	Use elementary concepts of probability and statistics.			
27.17	Draw, read, and analyze graphs, charts, and tables.			
27.18	Ask appropriate scientific questions and recognize what is involved in experimental approaches to the solutions of such questions through familiarity with laboratory and field work.			
27.19	Organize and communicate the results obtained by observation and experimentation.			
27.20	Apply the basic principles of biology, physics, and chemistry (properties of matter; structure of compounds; concepts of motion; temperature, pressure and volume; work, power, force and energy; machines; human cell structure).			
27.21	Identify problems rooted in basic biology, physics, or chemistry (effects of hazardous materials on health and safety, effects of drugs on health, troubleshooting problems on a machine).			
28.0	Demonstrate and apply design/problem-solving processes. – The student will be able to:			
28.01	Describe and explain steps in the design/problem-solving process.			
28.02	Propose solutions to given problems.			
28.03	Design and implement the optimal solution to a given problem.			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
28.04	Document each step of the design/problem-solving process.			
28.05	Demonstrate "brainstorming" as a process to solve problems.			
28.06	Define "critical thinking" and its value in the problem-solving process.			
29.0	Express an understanding of technological systems and their complex interrelationships. – The student will be able to:			
29.01	Demonstrate knowledge of how social, organizational, and technological systems work.			
29.02	Explore methods used to monitor and correct performance of technological systems.			
29.03	Design and implement an optimal solution to a given problem.			
29.04	Outline major historical technological developments or events.			
29.05	Identify recent advances in technology.			
29.06	Explain problem-solving roles of technology.			
29.07	Forecast a technological development or event.			
29.08	Define technology.			
30.0	Demonstrate the ability to properly identify, organize, plan, and allocate resources. – The student will be able to:			
30.01	Demonstrate the ability to select goal-relevant activities, rank them, allocate time, and prepare and follow schedules.			
30.02	Use or prepare budgets, make forecasts, keep records, and make adjustments to meet objectives.			
30.03	Demonstrate the ability to acquire, store, allocate, and use materials or space efficiently.			
30.04	Display knowledge of the efficient use of human resources.			
31.0	Discuss individual interests and aptitudes as they relate to a career. – The student will be able to:			
31.01	Describe individual strengths and weaknesses.			
31.02	Discuss individual interests related to a career.			
31.03	Identify careers within specific areas of technology.			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
	31.04 Explore careers within specific areas of interest.			
32.0	Demonstrate employability skills. – The student will be able to:			
	32.01 Conduct a job search.			
	32.02 Secure information about a career.			
	32.03 Identify documents that may be required when applying for a job interview.			
	32.04 Complete a job application form correctly.			
	32.05 Demonstrate competence in job interview techniques.			
	32.06 Prepare a resume for a job.			
33.0	Demonstrate an understanding of entrepreneurship. – The student will be able to:			
	33.01 Define entrepreneurship.			
	33.02 Describe the importance of entrepreneurship to the American economy.			
	33.03 List the advantages and disadvantages of business ownership.			
	33.04 Identify the risks involved in ownership of a business.			
	33.05 Identify the necessary personal characteristics of a successful entrepreneur.			
	33.06 Identify the business skills needed to operate a small business efficiently and effectively.			
34.0	Make an informed and meaningful career choice. – The student will be able to:			
	34.01 Make a tentative occupational choice based on the information learned and interest developed in this course.			
	34.02 Review tentative occupational choices based on the information learned and interest developed in this course.			
35.0	Identify evolving technologies in our technological world. – The student will be able to:			
	35.01 List five technologies that did not exist five years ago.			
	35.02 Use the problem-solving process to generate three potential improvements to a recent or evolving technology.			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
36.0	Demonstrate knowledge of the basic principles of technology, the basic elements of all systems, and the components of each basic element. – The student will be able to:			
36.01	Define the six basic principles of technology: force, work, rate, resistance, energy, and power.			
36.02	Name and define the three basic elements of all systems.			
36.03	Name components of the three basic elements of a system.			
36.04	Name the six basic parts of the energy system.			
36.05	State the function of each of the basic parts of the energy system.			
36.06	Name and explain the functions of the four common working energy systems: mechanical, electrical, fluid, and thermal.			
37.0	Demonstrate knowledge and perform special skills unique to the physical technologies. – The student will be able to:			
37.01	Define the function of construction technology, energy and power technology, manufacturing technology, and transportation technology.			
37.02	Describe three careers for each of the physical technologies identified in 37.01.			
37.03	Identify and demonstrate the tools, processes, and materials used in construction technology.			
37.04	Identify and demonstrate the equipment, processes, and materials used in energy and power technology for converting and transmitting power.			
37.05	Identify and demonstrate the tools, processes, and materials used in manufacturing technology to perform computer-aided manufacturing.			
37.06	Identify and demonstrate various ways that people and goods are transported.			
37.07	Demonstrate problem-solving skills relative to the physical technologies utilizing the techniques learned in this course.			
38.0	Demonstrate knowledge and perform special skills unique to the information/communication technologies. – The student will be able to:			
38.01	Define the function of information processing technology, graphic communication technology, and electronic communication technology.			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
38.02	Describe three careers for each of the communications technologies identified in 38.01.			
38.03	Identify and demonstrate the tools, processes and materials used in the information/communication technologies.			
38.04	Compare and contrast different processes of communication technologies.			
38.05	Demonstrate modern communication systems using sound and speech, symbols and codes, printed words, drawing and pictures.			
38.06	Identify the function of information processing technology, graphic communication technology, and electronic communication technology.			
38.07	Identify several telecommunication services.			
38.08	Demonstrate problem-solving skills relative to the information communication technologies utilizing the techniques learned in this course.			
39.0	Demonstrate knowledge and perform special skills unique to the biotechnologies. – The student will be able to:			
39.01	Define the function of biotechnology, medical technology, food production technology, and agriculture technology.			
39.02	Describe three careers for each of the technology areas in 39.01.			
39.03	Explain the three areas into which modern biotechnology is divided.			
39.04	Contrast the seven resources for biotechnology with other technologies.			
39.05	Identify several impacts of biotechnology on society and the environment.			
39.06	Identify the role of biotechnology in agriculture, food production, and medicine.			
39.07	Identify and describe the processes used in biotechnology and the related areas of produce outputs.			
39.08	Identify several outputs of biotechnology and their related biotechnologies.			
39.09	Demonstrate problem solving skills relative to biotechnology, or a related biotechnology utilizing the techniques learned in this course.			

Florida Department of Education
Student Performance Standards

Course Title: **Technology Studies II**
Course Number: **8600610**
Course Credit: **1**

Course Description:
This program provides students with an intermediate understanding of the knowledge, human relations, and technological skills found today in technical professions.

Florida Standards			Correlation to CTE Program Standard #
01.0	Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Technology Studies.		
	01.01 Key Ideas and Details		
	01.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. LAFS.910.RST.1.1	
	01.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.910.RST.1.2	
	01.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.910.RST.1.3	
	01.02 Craft and Structure		
	01.02.1	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. LAFS.910.RST.2.4	
	01.02.2	Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). LAFS.910.RST.2.5	
	01.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. LAFS.910.RST.2.6	

Florida Standards			Correlation to CTE Program Standard #
01.03	Integration of Knowledge and Ideas		
	01.03.1	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. LAFS.910.RST.3.7	
	01.03.2	Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. LAFS.910.RST.3.8	
	01.03.3	Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. LAFS.910.RST.3.9	
01.04	Range of Reading and Level of Text Complexity		
	01.04.1	By the end of grade 9, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	01.04.2	By the end of grade 10, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 9–10 text complexity band independently and proficiently. LAFS.910.RST.4.10	
02.0	Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Technology Studies.		
02.01	Text Types and Purposes		
	02.01.1	Write arguments focused on discipline-specific content. LAFS.910.WHST.1.1	
	02.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.910.WHST.1.2	
02.02	Production and Distribution of Writing		
	02.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.910.WHST.2.4	
	02.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.910.WHST.2.5	

Florida Standards			Correlation to CTE Program Standard #
	02.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. LAFS.910.WHST.2.6	
02.03	Research to Build and Present Knowledge		
	02.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.910.WHST.3.7	
	02.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. LAFS.910.WHST.3.8	
	02.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.910.WHST.3.9	
02.04	Range of Writing		
	02.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.910.WHST.4.10	
03.0	Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Technology Studies.		
03.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1		
03.02	Reason abstractly and quantitatively. MAFS.K12.MP.2.1		
03.03	Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1		
03.04	Model with mathematics. MAFS.K12.MP.4.1		
03.05	Use appropriate tools strategically. MAFS.K12.MP.5.1		

Florida Standards	Correlation to CTE Program Standard #
03.06 Attend to precision. MAFS.K12.MP.6.1	
03.07 Look for and make use of structure. MAFS.K12.MP.7.1	
03.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci	National Standards
04.0 Demonstrate an understanding of the characteristics and scope of technology. – The student will be able to:			
04.01 Illustrate the nature and development of technological knowledge and processes.			STL.1.J
04.02 Graph the rapid increase in the rate of technological development and diffusion.			STL.1.K
04.03 Conduct specific goal-directed research related to inventions and innovations.			STL.1.L
04.04 Evaluate current technological developments that are/were driven by profit motive and the market.			STL.1.M
05.0 Demonstrate an understanding of the core concepts of technology. – The student will be able to:			
05.01 Apply systems thinking logic and creativity with appropriate compromises in complex real-life problems.			
05.02 Discuss technological systems, which are the building blocks of technology and are embedded within larger technological, social, and environmental systems.			
05.03 Assess the stability of a technological system and its influence by all of the components in the system, especially those in the feedback loop.			
05.04 Select resources involving trade-offs between competing values, such as availability, cost, desirability, and waste.			
05.05 Identify the criteria and constraints of a product or system and then determine how they affect the final design and development.			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
05.06	Implement strategies for optimizing a technological process or methodology of designing or making a product, dependent on criteria and constraints.			
05.07	Identify new technologies that create new processes.			
05.08	Describe a quality control process to ensure that a product, service or system meets established criteria.			
05.09	Organize a management system as the process of planning, organizing, and controlling work.			
05.10	Outline complex systems that have many layers of controls and feedback loops to provide information.			
06.0	Demonstrate an understanding of the relationships among technologies and the connection between technology and other fields of study. . – The student will be able to:			
06.01	Discuss technology transfer occurring when a new user applies an existing innovation developed for one purpose in a different function.			
06.02	Explain technological innovation resulting when ideas, knowledge, or skills are shared within a technology, among technologies, or across other fields.			
06.03	Report the process of patenting to protect a technological idea.			
06.04	Discuss technological progresses that promote the advancement of science and mathematics.			
07.0	Demonstrate an understanding of the cultural, social, economic, and political effects of technology. – The student will be able to:			
07.01	Discuss changes caused by the use of technology ranging from gradual to rapid and from subtle to obvious.			
07.02	Compare the use of technology involving weighing the trade-offs between the positive and the negative effects.			
07.03	Discuss ethical considerations important in the development, selection, and use of technologies.			
07.04	Debate the cultural, social, economic, and political changes caused by the transfer of a technology from one society to another.			
08.0	Demonstrate an understanding of the effects of technology on the environment. – The student will be able to:			
08.01	Devise technologies to conserve water, soil, and energy through such techniques as reusing, reducing and recycling.			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
08.02	Compare trade-offs of developing technologies to reduce the use of resources.			
08.03	Use technology to monitor the environment and provide information as a basis for decision-making.			
08.04	Compare and contrast the alignment of technological processes with natural processes to maximize performance and reduce negative impacts on the environment.			
08.05	Assess technologies devised to reduce the negative consequences of other technologies.			
08.06	Make decisions about the implementation of technologies involving the weighing of trade-offs between predicted positive and negative effects on the environment.			
09.0	Demonstrate an understanding of the role of society in the development and use of technology. – The student will be able to:			
09.01	Report how different cultures develop their own technologies to satisfy their individual and shared needs, wants, and values.			
09.02	Consider societal opinions and demands, as well as corporate cultures to use as a basis for deciding whether or not to develop a technology.			
09.03	Consider a number of different factors, such as advertising, the strength of the economy, the goals of a company, and the latest fads as contributors to shaping the design of and demand for various technologies.			
10.0	Demonstrate an understanding of the influence of technology on history. – The student will be able to:			
10.01	Discuss how the evolution of civilization has been directly affected by, and has in turn affected, the development and use of tools and materials.			
10.02	Research the history of technology as a powerful force in reshaping the social, cultural, political, and economic landscape.			
10.03	Debate that early in the history of technology, the development of many tools and machines was based not on scientific knowledge but on technological know-how.			
10.04	Discuss the Iron Age as the use of iron and steel as the primary materials for tools.			
10.05	Discuss the Middle Ages and its development of many technological devices that produced long-lasting effects on technology and society.			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
10.06	Discuss the Renaissance, a time of rebirth of the arts and humanities, as an important development in the history of technology.			
10.07	Discuss the Industrial Revolution and the development of continuous manufacturing, sophisticated transportation and communication systems, advanced construction practices, and improved education and leisure time.			
10.08	Discuss the Information Age and its placement of emphasis on the processing and exchange of information.			
11.0	Demonstrate an understanding of the attributes of design. – The student will be able to:			
11.01	Describe the design process; including defining a problem, brainstorming, researching and generating ideas, identifying criteria and specifying constraints, exploring possibilities, selecting an approach, developing a design proposal, making a model or prototype, testing and evaluating the design using specifications, refining the design, creating or making it, and communicating processes and results.			
11.02	Translate design problems that are seldom presented in a clearly defined form.			
11.03	Evaluate a design continually, and improve and revise the idea of the design as needed.			
11.04	Analyze competing requirements of a design, such as criteria, constraints, and efficiency.			
12.0	Demonstrate an understanding of engineering design. – The student will be able to:			
12.01	Investigate design principles used to evaluate existing designs, to collect data, and to guide the design process.			
12.02	Examine the influence of personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly on the Engineering Design process.			
12.03	Construct a prototype or a working model used to test a design concept by making actual observations and necessary adjustments.			
12.04	Evaluate factors taken into account in the process of engineering.			
13.0	Demonstrate an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving. – The student will be able to:			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
13.01	Employ research and development as a specific problem solving approach that is used intensively in business and industry to prepare devices and systems for the marketplace.			
13.02	Conduct research needed to solve technological problems.			
13.03	Differentiate between technological and non-technological problems, and identify which problems can be solved using technology.			
13.04	Utilize a multidisciplinary approach to solving technological problems.			
14.0	Demonstrate the abilities to apply the design process. – The student will be able to:			
14.01	Interpret the design problem to solve and decide whether or not to address it.			
14.02	Evaluate criteria and constraints and determine how these will affect the design process.			
14.03	Refine a design by using prototypes and modeling to ensure quality, efficiency, and productivity of the final product.			
14.04	Evaluate the design solution using conceptual, physical, and mathematical models at various intervals of the design process in order to check for proper design and to note areas where improvements are needed.			
14.05	Produce a product or system using a design process.			
14.06	Evaluate final solutions and communicate observations, processes, and results of the entire design process, using verbal, graphic, quantitative, virtual, and written means, in addition to three-dimensional models.			
15.0	Demonstrate the abilities to use and maintain technological products and systems. – The student will be able to:			
15.01	Document processes and procedures and communicate them to different audiences using appropriate oral and written techniques.			
15.02	Diagnose a system that is malfunctioning and use tools, materials, machines, and knowledge to repair it.			
15.03	Troubleshoot, analyze, and maintain systems to ensure safe and proper function and precision.			
15.04	Operate systems so that they function in the way they were designed.			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
15.05	Use computers and calculators to access, retrieve, organize, process, maintain, interpret, and evaluate data and information in order to communicate.			
16.0	Demonstrate the abilities to assess the impact of products and systems. – The student will be able to:			
16.01	Collect information and evaluate its quality.			
16.02	Synthesize data, analyze trends, and draw conclusions regarding the effect of technology on the individual, society, and the environment.			
16.03	Apply assessment techniques, such as trend analysis and experimentation to make decisions about the future development of technology.			
16.04	Design forecasting techniques to evaluate the results of altering natural systems.			
17.0	Demonstrate an understanding of and be able to select and use medical technologies. – The student will be able to:			
17.01	Classify medical technologies including prevention and rehabilitation, vaccines and pharmaceuticals, medical and surgical procedures, genetic engineering, and the systems within which health is protected and maintained.			
17.02	Discuss telemedicine and its convergence of technological advances in a number of fields, including medicine, virtual presence, computer engineering, informatics, artificial intelligence, robotics, materials science, and perceptual psychology.			
17.03	Explain how the sciences of biochemistry and molecular biology have made it possible to manipulate the genetic information found in living creatures.			
18.0	Demonstrate an understanding of and be able to select and use agricultural and related biotechnologies. – The student will be able to:			
18.01	Discuss agriculture, including a combination of businesses that use a wide array of products and systems to produce, process, and distribute food, fiber, fuel, chemical, and other useful products.			
18.02	Identify biotechnology applications in such areas as agriculture, pharmaceuticals, food and beverages, medicine, energy, the environment, and genetic engineering.			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
18.03	Define conservation as the process of controlling soil erosion, reducing sediment in waterways, and improving water quality.			
18.04	Apply engineering design processes to management of agricultural systems requiring knowledge of artificial ecosystems and the effects of technological development on flora and fauna.			
19.0	Demonstrate an understanding of and be able to select and use energy and power technologies. – The student will be able to:			
19.01	Discuss how energy cannot be created nor destroyed; however, it can be converted from one form to another.			
19.02	Categorize types of energy into major forms: thermal, radiant, electrical, mechanical, chemical, nuclear, and others.			
19.03	Explain impossibility of building an engine to perform work that does not exhaust thermal energy to the surroundings.			
19.04	Classify energy resources as renewable or nonrenewable.			
19.05	Construct a power system having a source of energy, a process, and loads.			
20.0	Demonstrate an understanding of and be able to select and use information and communication technologies. – The student will be able to:			
20.01	Discuss information and communication technologies including the inputs, processes, and outputs associated with sending and receiving information.			
20.02	Classify information and communication systems that allow information to be transferred as human to human, human to machine, machine to human, or machine to machine.			
20.03	Use information and communication systems to inform, persuade, entertain, control, manage, and educate.			
20.04	Identify components of a communications system, including source, encoder, transmitter, receiver, decoder, storage, retrieval, and destination.			
20.05	Identify many ways to communicate information, such as graphic and electronic means.			
20.06	Communicate technological knowledge and processes using symbols, measurement, conventions, icons, graphic images, and languages that incorporate a variety of visual, auditory, and tactile stimuli.			
21.0	Demonstrate an understanding of and be able to select and use transportation technologies. – The student will be able to:			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
21.01	Analyze the vital role played by transportation in the operation of other technologies, such as manufacturing, construction, communication, health and safety, and agriculture.			
21.02	Define intermodalism as the use of different modes of transportation, such as highways, railways, and waterways as part of an interconnected system that can move people and goods easily from one mode to another.			
21.03	Discuss how transportation services and methods have led to a population that is regularly on the move.			
21.04	Identify processes and innovative techniques involved in the design of intelligent and non-intelligent transportation systems.			
22.0	Demonstrate an understanding of and be able to select and use manufacturing technologies. – The student will be able to:			
22.01	Service products to keep them in good operating condition.			
22.02	Classify materials based on their qualities as natural, synthetic, or mixed.			
22.03	Classify goods as durable goods designed to operate for a long period of time, or non-durable goods designed to operate for a short period of time.			
22.04	Identify and classify manufacturing systems into types, such as customized production, batch production, and continuous production.			
22.05	Discuss the interchangeability of parts to increase the effectiveness of manufacturing processes.			
22.06	Identify chemical technologies providing a means for humans to alter or modify materials and to produce chemical products.			
22.07	Employ marketing techniques involving establishing a product's identity, conducting research on its potential, advertising it, distributing it, and selling it.			
23.0	Demonstrate an understanding of and be able to select and use construction technologies. – The student will be able to:			
23.01	Define infrastructure as the underlying base or basic framework of a system.			STL.20.J
23.02	Identify a variety of processes and procedures used in constructing structures.			STL.20.K
23.03	Identify requirements involved in the design of structures.			STL.20.L
23.04	Recommend maintenance, alterations, or renovations to improve a structure or alter its intended use.			STL.20.M

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
	23.05 Identify prefabricated materials used in some structures.			STL.20.N
24.0	Demonstrate the ability to work safely with a variety of technologies. – The student will be able to:			
	24.01 Select appropriate tools, procedures, and/or equipment needed to produce a product.			
	24.02 Demonstrate the safe usage of appropriate tools, procedures, and operation of equipment needed to produce a product.			
	24.03 Demonstrate knowledge required to maintain and troubleshoot equipment used in a variety of technological systems.			
	24.04 Follow laboratory safety rules and procedures.			
	24.05 Demonstrate good housekeeping at work station within total laboratory.			
	24.06 Identify color-coding safety standards.			
	24.07 Explain fire prevention and safety precautions and practices for extinguishing fires.			
	24.08 Identify harmful effects/potential dangers of familiar hazardous substances/devices to people and the environment.			
25.0	Demonstrate interpersonal skills as they relate to the workplace. – The student will be able to:			
	25.01 Perform roles in a student personnel system or in the Florida Technology Student Association (FL-TSA).			
	25.02 Participate as a member of a team.			
	25.03 Teach others new skills.			
	25.04 Identify skills needed to serve clients/customers.			
	25.05 Demonstrate leadership skills.			
	25.06 Describe strategies necessary for negotiating agreements.			
	25.07 Demonstrate the application of skills necessary to work with people of diverse backgrounds.			
	25.08 Form an understanding and appreciation for work after listening to or observing technology workers.			
	25.09 Form an understanding and appreciation for work after participating in a simulated technology group project in the laboratory.			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
25.10	Form an understanding and appreciation for the roles and work of co-workers.			
26.0	Identify and apply methods of information acquisition and utilizations. – The student will be able to:			
26.01	Define terms related to computers.			
26.02	Identify and describe methods of information acquisition and evaluation.			
26.03	Discuss advantages and disadvantages in the application of technologies.			
26.04	Produce a plan to organize and maintain information relevant to emerging technologies.			
26.05	Comprehend and communicate information relevant to emerging technologies.			
26.06	Demonstrate the use of computers to process information.			
27.0	Apply basic skills in communications, mathematics, and science appropriate to technological content and learning activities. – The student will be able to:			
27.01	Identify and explain the main and subordinate ideas in a written work.			
27.02	Distinguish different purposes and methods of writing, identify a writer's point of view and tone, and interpret a writer's meaning.			
27.03	Define unfamiliar words by use of structural analysis, decoding, contextual clues, or by using a dictionary.			
27.04	Distinguish fact from opinion.			
27.05	Read critically by asking pertinent questions, by recognizing assumptions and implications, and by evaluating ideas.			
27.06	Select, relate, and organize, ideas using outlining and/or graphic organizers and develop the ideas in coherent paragraphs.			
27.07	Improve one's own writing by restructuring, correcting errors, and rewriting.			
27.08	Gather and organize information from primary and secondary sources; write a report using this research; quote, paraphrase, and summarize accurately; and cite sources properly.			
27.09	Vary one's writing style, including vocabulary and sentence structure, for different readers and purposes.			
27.10	Write logical and understandable statements, or phrases, to accurately fill out commonly used forms.			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
27.11	Compose unified and coherent correspondence, directions, descriptions, explanations and reports.			
27.12	Participate critically and constructively in the exchange of ideas, particularly during class discussions and conferences with instructors.			
27.13	Conceive and develop ideas about a topic for the purpose of speaking to a group; choose and organize related ideas; present them clearly in Standard English; and evaluate similar presentations by others.			
27.14	Use the mathematics of:			
	a) integers, fractions, and decimals;			
	b) ratios, proportions, and percentages;			
	c) roots and powers;			
	d) algebra;			
	e) geometry;			
27.15	Make estimates and approximations, and judge the reasonableness of a result.			
27.16	Use elementary concepts of probability and statistics.			
27.17	Draw, read, and analyze graphs, charts, and tables.			
27.18	Ask appropriate scientific questions and recognize what is involved in experimental approaches to the solutions of such questions through familiarity with laboratory and field work.			
27.19	Organize and communicate the results obtained by observation and experimentation.			
27.20	Apply the basic principles of biology, physics, and chemistry (properties of matter; structure of compounds; concepts of motion; temperature, pressure and volume; work, power, force and energy; machines; human cell structure).			
27.21	Identify problems rooted in basic biology, physics, or chemistry (effects of hazardous materials on health and safety, effects of drugs on health, troubleshooting problems on a machine).			
28.0	Demonstrate and apply design/problem-solving processes. – The student will be able to:			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
28.01	Describe and explain steps in the design/problem-solving process.			
28.02	Propose solutions to given problems.			
28.03	Design and implement the optimal solution to a given problem.			
28.04	Document each step of the design/problem-solving process.			
28.05	Demonstrate "brainstorming" as a process to solve problems.			
28.06	Define "critical thinking" and its value in the problem-solving process.			
29.0	Express an understanding of technological systems and their complex interrelationships. – The student will be able to:			
29.01	Demonstrate knowledge of how social, organizational, and technological systems work.			
29.02	Explore methods used to monitor and correct performance of technological systems.			
29.03	Design and implement an optimal solution to a given problem.			
29.04	Outline major historical technological developments or events.			
29.05	Identify recent advances in technology.			
29.06	Explain problem-solving roles of technology.			
29.07	Forecast a technological development or event.			
29.08	Define technology.			
30.0	Demonstrate the ability to properly identify, organize, plan, and allocate resources. – The student will be able to:			
30.01	Demonstrate the ability to select goal-relevant activities, rank them, allocate time, and prepare and follow schedules.			
30.02	Use or prepare budgets, make forecasts, keep records, and make adjustments to meet objectives.			
30.03	Demonstrate the ability to acquire, store, allocate, and use materials or space efficiently.			
30.04	Display knowledge of the efficient use of human resources.			
31.0	Discuss individual interests and aptitudes as they relate to a career. – The student will be able to:			

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci	National Standards
31.01 Describe individual strengths and weaknesses.			
31.02 Discuss individual interests related to a career.			
31.03 Identify careers within specific areas of technology.			
31.04 Explore careers within specific areas of interest.			
32.0 Demonstrate employability skills. – The student will be able to:			
32.01 Conduct a job search.			
32.02 Secure information about a career.			
32.03 Identify documents that may be required when applying for a job interview.			
32.04 Complete a job application form correctly.			
32.05 Demonstrate competence in job interview techniques.			
32.06 Prepare a resume for a job.			
33.0 Demonstrate an understanding of entrepreneurship. – The student will be able to:			
33.01 Define entrepreneurship.			
33.02 Describe the importance of entrepreneurship to the American economy.			
33.03 List the advantages and disadvantages of business ownership.			
33.04 Identify the risks involved in ownership of a business.			
33.05 Identify the necessary personal characteristics of a successful entrepreneur.			
33.06 Identify the business skills needed to operate a small business efficiently and effectively.			
34.0 Make an informed and meaningful career choice. – The student will be able to:			
34.01 Make a tentative occupational choice based on the information learned and interest developed in this course.			
34.02 Review tentative occupational choices based on the information learned and interest developed in this course.			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
36.0	Demonstrate knowledge of the basic principles of technology, the basic elements of all systems, and the components of each basic element. – The student will be able to:			
36.01	Define the six basic principles of technology: force, work, rate, resistance, energy, and power.			
36.02	Name and define the three basic elements of all systems.			
36.03	Name components of the three basic elements of a system.			
36.04	Name the six basic parts of the energy system.			
36.05	State the function of each of the basic parts of the energy system.			
36.06	Name and explain the functions of the four common working energy systems: mechanical, electrical, fluid, and thermal.			
37.0	Demonstrate knowledge and perform special skills unique to the physical technologies. – The student will be able to:			
37.01	Define the function of construction technology, energy and power technology, manufacturing technology, and transportation technology.			
37.02	Describe three careers for each of the physical technologies identified in 37.01.			
37.03	Identify and demonstrate the tools, processes, and materials used in construction technology.			
37.04	Identify and demonstrate the equipment, processes, and materials used in energy and power technology for converting and transmitting power.			
37.05	Identify and demonstrate the tools, process, and materials used in manufacturing technology to perform computer-aided manufacturing.			
37.06	Identify and demonstrate various ways that people and goods are transported.			
37.07	Demonstrate problem-solving skills relative to the physical technologies utilizing the techniques learned in the course.			
38.0	Demonstrate knowledge and perform special skills unique to the information/communication technologies. – The student will be able to:			
38.01	Define the function of information processing technology, graphic communication technology, and electronic communication technology.			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
38.02	Describe three careers for each of the communications technologies identified in 39.01.			
38.03	Identified and demonstrate the tools, processes and materials used in the information/communication technologies.			
38.04	Compare and contrast different processes of communication technologies.			
38.05	Demonstrate modern communication systems using sound and speech, symbols and codes, printed works, drawing and pictures.			
38.06	Identify the function of information processing technology, graphic communication technology, and electronic communication technology.			
38.07	Identify several telecommunication services.			
38.08	Demonstrate problem-solving skills relative to the information communication technologies utilizing the techniques learned in this course.			
39.0	Demonstrate knowledge and perform special skills unique to the biotechnologies. – The student will be able to:			
39.01	Define the function of biotechnology, medical technology, food production technology, and agriculture technology.			
39.02	Describe three careers for each of the technology areas in 39.01.			
39.03	Explain the three areas into which modern biotechnology is divided.			
39.04	Contrast the seven resources for biotechnology with other technologies.			
39.05	Identify several impacts of biotechnology on society and the environment.			
39.06	Identify the role of biotechnology in agriculture, food production, and medicine.			
39.07	Identify and describe the processes used in biotechnology and the related areas of produce outputs.			
39.08	Identify several outputs of biotechnology and their related biotechnologies.			
39.09	Demonstrate problem-solving skills relative to biotechnology, or a related biotechnology utilizing the techniques learned in this course.			
40.0	Demonstrate knowledge and application of robotics technology. – The student will be able to:			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
	40.01 Identify three types of robots.			
	40.02 State the function of effectors, sensors, controllers, and auxiliary parts in a robotics system.			
	40.03 Operate a robot using a teach pendant.			
	40.04 Program a robot using a computer to perform a specific task.			
	40.05 Explain three impacts of robotics on society.			
	40.06 Demonstrate problem-solving skills relative to robotics utilizing the techniques learned in this course.			
41.0	Demonstrate knowledge and application of programmable controller technology. – The student will be able to:			
	41.01 State the function of the component parts of a programmable controller.			
	41.02 List several advantages of using programmable controllers.			
	41.03 Demonstrate logical continuity and branching functions with a programmable controller.			
42.0	Demonstrate knowledge and application of computer numerical control technology. – The student will be able to:			
	42.01 Demonstrate the technique of computer numerical control to perform and engraving and a milling activity.			
	42.02 Demonstrate problem-solving skills relative to computer numerical control utilizing the techniques learned in this course.			
43.0	Demonstrate knowledge and application of computer-aided drafting technology. – The student will be able to:			
	43.01 Compare and contrast computer-aided drafting with non-computer aided drafting in terms of speed consistency, neatness, and accuracy.			
	43.02 Demonstrate the application of a computer and software program in doing several computer-aided drawings.			
	43.03 Identify computer-aided drafting hardware.			
	43.04 Demonstrate program-solving skills relative to computer-aided drafting utilizing the techniques learned in this course.			
44.0	Demonstrate knowledge and application of laser technology. – The student will be able to:			
	44.01 Describe five applications of lasers.			

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci	National Standards
44.02 Perform laser experiments demonstrating knowledge of:			
44.03 Characteristics of laser light.			
44.04 Characteristics of light waves.			
44.05 List the safety precautions that one observes when working with a laser.			
44.06 Assemble, operate and identify the parts of a laser optics system.			
44.07 Demonstrate the use of a laser to do measurements, transmit data, and monitor.			

Florida Department of Education
Student Performance Standards

Course Title: **Technology Studies III**
Course Number: **8601710**
Course Credit: **1**

Course Description:
This program provides students with an advanced understanding of the knowledge, human relations, and technological skills found today in technical professions.

Florida Standards			Correlation to CTE Program Standard #
45.0	Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Technology Studies.		
	45.01 Key Ideas and Details		
	45.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. LAFS.1112.RST.1.1	
	45.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.1112.RST.1.2	
	45.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.1112.RST.1.3	
	45.02 Craft and Structure		
	45.02.1	Determine the meaning of symbols key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. LAFS.1112.RST.2.4	
	45.02.2	Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. LAFS.1112.RST.2.5	
	45.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. LAFS.1112.RST.2.6	

Florida Standards			Correlation to CTE Program Standard #
45.03	Integration of Knowledge and Ideas		
	45.03.1	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g. quantitative data, video, multimedia) in order to address a question or solve a problem. LAFS.1112.RST.3.7	
	45.03.2	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. LAFS.1112.RST.3.8	
	45.03.3	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. LAFS.1112.RST.3.9	
45.04	Range of Reading and Level of Text Complexity		
	45.04.1	By the end of grade 11, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	45.04.2	By the end of grade 12, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 11–CCR text complexity band independently and proficiently. LAFS.1112.RST.4.10	
46.0	Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Technology Studies.		
46.01	Text Types and Purposes		
	46.01.1	Write arguments focused on discipline-specific content. LAFS.1112.WHST.1.1	
	46.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.1112.WHST.1.2	
46.02	Production and Distribution of Writing		
	46.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.1112.WHST.2.4	

Florida Standards			Correlation to CTE Program Standard #
	46.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.1112.WHST.2.5	
	46.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. LAFS.1112.WHST.2.6	
	46.03	Research to Build and Present Knowledge	
	46.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.1112.WHST.3.7	
	46.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. LAFS.1112.WHST.3.8	
	46.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.1112.WHST.3.9	
	46.04	Range of Writing	
	46.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.1112.WHST.4.10	
47.0		Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Technology Studies.	
	47.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	
	47.02	Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
	47.03	Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	

Florida Standards	Correlation to CTE Program Standard #
47.04 Model with mathematics. MAFS.K12.MP.4.1	
47.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
47.06 Attend to precision. MAFS.K12.MP.6.1	
47.07 Look for and make use of structure. MAFS.K12.MP.7.1	
47.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci	National Standards
04.0 Demonstrate an understanding of the characteristics and scope of technology. – The student will be able to:			
04.01 Discuss the nature and development of technological knowledge and processes.			STL.1.J
04.02 Graph the rapid increase in the rate of technological development and diffusion.			STL.1.K
04.03 Conduct specific goal-directed research related to inventions and innovations.			STL.1.L
04.04 Evaluate current technological developments that are/were driven by profit motive and the market.			STL.1.M
05.0 Demonstrate an understanding of the core concepts of technology. – The student will be able to:			
05.01 Apply systems thinking logic and creativity with appropriate compromises in complex real-life problems.			
05.02 Assess technological systems, which are the building blocks of technology and are embedded within larger technological, social, and environmental systems.			
05.03 Assess the stability of a technological system and its influence by all of the components in the system, especially those in the feedback loop.			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
05.04	Compare resources involving trade-offs between competing values, such as availability, cost, desirability, and waste.			
05.05	Identify the criteria and constraints of a product or system and then determine how they affect the final design and development.			
05.06	Propose strategies for optimizing a technological process or methodology of designing or making a product, dependent on criteria and constraints.			
05.07	Discuss new technologies that create new processes.			
05.08	Recommend a quality control process to ensure that a product, service or system meets established criteria.			
05.09	Organize a management system as the process of planning, organizing, and controlling work.			
05.10	Outline complex systems that have many layers of controls and feedback loops to provide information.			
06.0	Demonstrate an understanding of the relationships among technologies and the connection between technology and other fields of study. – The student will be able to:			
06.01	Create technology transfer occurring when a new user applies an existing innovation developed for one purpose in a different function.			
06.02	Examine technological innovation resulting when ideas, knowledge, or skills are shared within a technology, among technologies, or across other fields.			
06.03	Report the process of patenting to protect a technological idea.			
06.04	Investigate technological progresses that promote the advancement of science and mathematics.			
07.0	Demonstrate an understanding of the cultural, social, economic, and political effects of technology. – The student will be able to:			
07.01	Discuss changes caused by the use of technology ranging from gradual to rapid and from subtle to obvious.			
07.02	Evaluate the use of technology involving weighing the trade-offs between the positive and the negative effects.			
07.03	Discuss ethical considerations important in the development, selection, and use of technologies.			
07.04	Debate the cultural, social, economic, and political changes caused by the transfer of a technology from one society to another.			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
08.0	Demonstrate an understanding of the effects of technology on the environment. – The student will be able to:			
08.01	Devise technologies to conserve water, soil, and energy through such techniques as reusing, reducing and recycling.			
08.02	Consider trade-offs of developing technologies to reduce the use of resources.			
08.03	Use technology to monitor the environment and provide information as a basis for decision-making.			
08.04	Compare and contrast the alignment of technological processes with natural processes to maximize performance and reduce negative impacts on the environment.			
08.05	Assess technologies devised to reduce the negative consequences of other technologies.			
08.06	Make decisions about the implementation of technologies involving the weighing of trade-offs between predicted positive and negative effects on the environment.			
09.0	Demonstrate an understanding of the role of society in the development and use of technology. – The student will be able to:			
09.01	Report how different cultures develop their own technologies to satisfy their individual and shared needs, wants, and values.			
09.02	Consider societal opinions and demands, as well as corporate cultures to use as a basis for deciding whether or not to develop a technology.			
09.03	Evaluate a number of different factors, such as advertising, the strength of the economy, the goals of a company, and the latest fads as contributors to shaping the design of and demand for various technologies.			
10.0	Demonstrate an understanding of the influence of technology on history. – The student will be able to:			
10.01	Assess how the evolution of civilization has been directly affected by, and has in turn affected, the development and use of tools and materials.			
10.02	Research the history of technology as a powerful force in reshaping the social, cultural, political, and economic landscape.			
10.03	Debate that early in the history of technology, the development of many tools and machines was based not on scientific knowledge but on technological know-how.			
10.04	Discuss the Iron Age as the use of iron and steel as the primary materials for tools.			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
10.05	Discuss the Middle Ages and its development of many technological devices that produced long-lasting effects on technology and society.			
10.06	Discuss the Renaissance, a time of rebirth of the arts and humanities, as an important development in the history of technology.			
10.07	Discuss the Industrial Revolution and the development of continuous manufacturing, sophisticated transportation and communication systems, advanced construction practices, and improved education and leisure time.			
10.08	Discuss the Information Age and its placement of emphasis on the processing and exchange of information.			
11.0	Demonstrate an understanding of the attributes of design. – The student will be able to:			
11.01	Implement the design process; including defining a problem, brainstorming, researching and generating ideas, identifying criteria and specifying constraints, exploring possibilities, selecting an approach, developing a design proposal, making a model or prototype, testing and evaluating the design using specifications, refining the design, creating or making it, and communicating processes and results.			
11.02	Translate design problems that are seldom presented in a clearly defined form.			
11.03	Evaluate a design continually, and improve and revise the idea of the design as needed.			
11.04	Analyze competing requirements of a design, such as criteria, constraints, and efficiency.			
12.0	Demonstrate an understanding of engineering design. – The student will be able to:			
12.01	Select design principles used to evaluate existing designs, to collect data, and to guide the design process.			
12.02	Examine the influence of personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly on the Engineering Design process.			
12.03	Construct a prototype or a working model used to test a design concept by making actual observations and necessary adjustments.			
12.04	Evaluate factors taken into account in the process of engineering.			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
13.0	Demonstrate an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving. – The student will be able to:			
13.01	Employ research and development as a specific problem solving approach that is used intensively in business and industry to prepare devices and systems for the marketplace.			
13.02	Conduct research needed to solve technological problems.			
13.03	Differentiate between technological and non-technological problems, and identify which problems can be solved using technology.			
13.04	Utilize a multidisciplinary approach to solving technological problems.			
14.0	Demonstrate the abilities to apply the design process. – The student will be able to:			
14.01	Interpret the design problem to solve and decide whether or not to address it.			
14.02	Evaluate criteria and constraints and determine how these will affect the design process.			
14.03	Refine a design by using prototypes and modeling to ensure quality, efficiency, and productivity of the final product.			
14.04	Evaluate the design solution using conceptual, physical, and mathematical models at various intervals of the design process in order to check for proper design and to note areas where improvements are needed.			
14.05	Produce a product or system using a design process.			
14.06	Evaluate final solutions and communicate observations, processes, and results of the entire design process, using verbal, graphic, quantitative, virtual, and written means, in addition to three-dimensional models.			
15.0	Demonstrate the abilities to use and maintain technological products and systems. – The student will be able to:			
15.01	Document processes and procedures and communicate them to different audiences using appropriate oral and written techniques.			
15.02	Diagnose a system that is malfunctioning and use tools, materials, machines, and knowledge to repair it.			
15.03	Troubleshoot, analyze, and maintain systems to ensure safe and proper function and precision.			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
15.04	Operate systems so that they function in the way they were designed.			
15.05	Use computers and calculators to access, retrieve, organize, process, maintain, interpret, and evaluate data and information in order to communicate.			
16.0	Demonstrate the abilities to assess the impact of products and systems. – The student will be able to:			
16.01	Collect information and evaluate its quality.			
16.02	Synthesize data, analyze trends, and draw conclusions regarding the effect of technology on the individual, society, and the environment.			
16.03	Apply assessment techniques, such as trend analysis and experimentation to make decisions about the future development of technology.			
16.04	Design forecasting techniques to evaluate the results of altering natural systems.			
17.0	Demonstrate an understanding of and be able to select and use medical technologies. – The student will be able to:			
17.01	Classify medical technologies including prevention and rehabilitation, vaccines and pharmaceuticals, medical and surgical procedures, genetic engineering, and the systems within which health is protected and maintained.			
17.02	Discuss telemedicine and its convergence of technological advances in a number of fields, including medicine, virtual presence, computer engineering, informatics, artificial intelligence, robotics, materials science, and perceptual psychology.			
17.03	Explain how the sciences of biochemistry and molecular biology have made it possible to manipulate the genetic information found in living creatures.			
18.0	Demonstrate an understanding of and be able to select and use agricultural and related biotechnologies. – The student will be able to:			
18.01	Discuss agriculture, including a combination of businesses that use a wide array of products and systems to produce, process, and distribute food, fiber, fuel, chemical, and other useful products.			
18.02	Identify biotechnology applications in such areas as agriculture, pharmaceuticals, food and beverages, medicine, energy, the environment, and genetic engineering.			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
18.03	Define conservation as the process of controlling soil erosion, reducing sediment in waterways, and improving water quality.			
18.04	Apply engineering design processes to management of agricultural systems requiring knowledge of artificial ecosystems and the effects of technological development on flora and fauna.			
19.0	Demonstrate an understanding of and be able to select and use energy and power technologies. – The student will be able to:			
19.01	Discuss how energy cannot be created nor destroyed; however, it can be converted from one form to another.			
19.02	Categorize types of energy into major forms: thermal, radiant, electrical, mechanical, chemical, nuclear, and others.			
19.03	Explain impossibility of building an engine to perform work that does not exhaust thermal energy to the surroundings.			
19.04	Classify energy resources as renewable or nonrenewable.			
19.05	Construct a power system having a source of energy, a process, and loads.			
20.0	Demonstrate an understanding of and be able to select and use information and communication technologies. – The student will be able to:			
20.01	Discuss information and communication technologies including the inputs, processes, and outputs associated with sending and receiving information.			
20.02	Classify information and communication systems that allow information to be transferred as human to human, human to machine, machine to human, or machine to machine.			
20.03	Use information and communication systems to inform, persuade, entertain, control, manage, and educate.			
20.04	Identify components of a communications system, including source, encoder, transmitter, receiver, decoder, storage, retrieval, and destination.			
20.05	Identify many ways to communicate information, such as graphic and electronic means.			
20.06	Communicate technological knowledge and processes using symbols, measurement, conventions, icons, graphic images, and languages that incorporate a variety of visual, auditory, and tactile stimuli.			
21.0	Demonstrate an understanding of and be able to select and use transportation technologies. – The student will be able to:			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
21.01	Analyze the vital role played by transportation in the operation of other technologies, such as manufacturing, construction, communication, health and safety, and agriculture.			
21.02	Define intermodalism as the use of different modes of transportation, such as highways, railways, and waterways as part of an interconnected system that can move people and goods easily from one mode to another.			
21.03	Discuss how transportation services and methods have led to a population that is regularly on the move.			
21.04	Identify processes and innovative techniques involved in the design of intelligent and non-intelligent transportation systems.			
22.0	Demonstrate an understanding of and be able to select and use manufacturing technologies. – The student will be able to:			
22.01	Service products to keep them in good operating condition.			
22.02	Classify materials based on their qualities as natural, synthetic, or mixed.			
22.03	Classify goods as durable goods designed to operate for a long period of time, or non-durable goods designed to operate for a short period of time.			
22.04	Identify and classify manufacturing systems into types, such as customized production, batch production, and continuous production.			
22.05	Discuss the interchangeability of parts to increase the effectiveness of manufacturing processes.			
22.06	Identify chemical technologies providing a means for humans to alter or modify materials and to produce chemical products.			
22.07	Employ marketing techniques involving establishing a product's identity, conducting research on its potential, advertising it, distributing it, and selling it.			
23.0	Demonstrate an understanding of and be able to select and use construction technologies. – The student will be able to:			
23.01	Define infrastructure as the underlying base or basic framework of a system.			STL.20.J
23.02	Identify a variety of processes and procedures used in constructing structures.			STL.20.K
23.03	Identify requirements involved in the design of structures.			STL.20.L
23.04	Recommend maintenance, alterations, or renovations to improve a structure or alter its intended use.			STL.20.M

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
	23.05 Identify prefabricated materials used in some structures.			STL.20.N
24.0	Demonstrate the ability to work safely with a variety of technologies. – The student will be able to:			
	24.01 Select appropriate tools, procedures, and/or equipment needed to produce a product.			
	24.02 Demonstrate the safe usage of appropriate tools, procedures, and operation of equipment needed to produce a product.			
	24.03 Demonstrate knowledge required to maintain and troubleshoot equipment used in a variety of technological systems.			
	24.04 Follow laboratory safety rules and procedures.			
	24.05 Demonstrate good housekeeping at work station within total laboratory.			
	24.06 Identify color-coding safety standards.			
	24.07 Explain fire prevention and safety precautions and practices for extinguishing fires.			
	24.08 Identify harmful effects/potential dangers of familiar hazardous substances/devices to people and the environment.			
25.0	Demonstrate interpersonal skills as they relate to the workplace. – The student will be able to:			
	25.01 Perform roles in a student personnel system or in the Florida Technology Student Association (FL-TSA).			
	25.02 Participate as a member of a team.			
	25.03 Teach others new skills.			
	25.04 Identify skills needed to serve clients/customers.			
	25.05 Demonstrate leadership skills.			
	25.06 Describe strategies necessary for negotiating agreements.			
	25.07 Demonstrate the application of skills necessary to work with people of diverse backgrounds.			
	25.08 Form an understanding and appreciation for work after listening to or observing technology workers.			
	25.09 Form an understanding and appreciation for work after participating in a simulated technology group project in the laboratory.			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
25.10	Form an understanding and appreciation for the roles and work of co-workers.			
26.0	Identify and apply methods of information acquisition and utilizations. – The student will be able to:			
26.01	Define terms related to computers.			
26.02	Identify and describe methods of information acquisition and evaluation.			
26.03	Discuss advantages and disadvantages in the application of technologies.			
26.04	Produce a plan to organize and maintain information relevant to emerging technologies.			
26.05	Comprehend and communicate information relevant to emerging technologies.			
26.06	Demonstrate the use of computers to process information.			
27.0	Apply basic skills in communications, mathematics, and science appropriate to technological content and learning activities. – The student will be able to:			
27.01	Identify and explain the main and subordinate ideas in a written work.			
27.02	Distinguish different purposes and methods of writing, identify a writer's point of view and tone, and interpret a writer's meaning.			
27.03	Define unfamiliar words by use of structural analysis, decoding, contextual clues, or by using a dictionary.			
27.04	Distinguish fact from opinion.			
27.05	Read critically by asking pertinent questions, by recognizing assumptions and implications, and by evaluating ideas.			
27.06	Select, relate, and organize, ideas using outlining and/or graphic organizers and develop the ideas in coherent paragraphs.			
27.07	Improve one's own writing by restructuring, correcting errors, and rewriting.			
27.08	Gather and organize information from primary and secondary sources; write a report using this research; quote, paraphrase, and summarize accurately; and cite sources properly.			
27.09	Vary one's writing style, including vocabulary and sentence structure, for different readers and purposes.			
27.10	Write logical and understandable statements, or phrases, to accurately fill out commonly used forms.			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
27.11	Compose unified and coherent correspondence, directions, descriptions, explanations and reports.			
27.12	Participate critically and constructively in the exchange of ideas, particularly during class discussions and conferences with instructors.			
27.13	Conceive and develop ideas about a topic for the purpose of speaking to a group; choose and organize related ideas; present them clearly in Standard English; and evaluate similar presentations by others.			
27.14	Use the mathematics of:			
	a) integers, fractions, and decimals;			
	b) ratios, proportions, and percentages;			
	c) roots and powers;			
	d) algebra;			
	e) geometry;			
27.15	Make estimates and approximations, and judge the reasonableness of a result.			
27.16	Use elementary concepts of probability and statistics.			
27.17	Draw, read, and analyze graphs, charts, and tables.			
27.18	Ask appropriate scientific questions and recognize what is involved in experimental approaches to the solutions of such questions through familiarity with laboratory and field work.			
27.19	Organize and communicate the results obtained by observation and experimentation.			
27.20	Apply the basic principles of biology, physics, and chemistry (properties of matter; structure of compounds; concepts of motion; temperature, pressure and volume; work, power, force and energy; machines; human cell structure).			
27.21	Identify problems rooted in basic biology, physics, or chemistry (effects of hazardous materials on health and safety, effects of drugs on health, troubleshooting problems on a machine).			
28.0	Demonstrate and apply design/problem-solving processes. – The student will be able to:			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
28.01	Describe and explain steps in the design/problem-solving process.			
28.02	Propose solutions to given problems.			
28.03	Design and implement the optimal solution to a given problem.			
28.04	Document each step of the design/problem-solving process.			
28.05	Demonstrate "brainstorming" as a process to solve problems.			
28.06	Define "critical thinking" and its value in the problem-solving process.			
29.0	Express an understanding of technological systems and their complex interrelationships. – The student will be able to:			
29.01	Demonstrate knowledge of how social, organizational, and technological systems work.			
29.02	Explore methods used to monitor and correct performance of technological systems.			
29.03	Design and implement an optimal solution to a given problem.			
29.04	Outline major historical technological developments or events.			
29.05	Identify recent advances in technology.			
29.06	Explain problem-solving roles of technology.			
29.07	Forecast a technological development or event.			
29.08	Define technology.			
30.0	Demonstrate the ability to properly identify, organize, plan, and allocate resources. – The student will be able to:			
30.01	Demonstrate the ability to select goal-relevant activities, rank them, allocate time, and prepare and follow schedules.			
30.02	Use or prepare budgets, make forecasts, keep records, and make adjustments to meet objectives.			
30.03	Demonstrate the ability to acquire, store, allocate, and use materials or space efficiently.			
30.04	Display knowledge of the efficient use of human resources.			
31.0	Discuss individual interests and aptitudes as they relate to a career. – The student will be able to:			

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci	National Standards
31.01 Describe individual strengths and weaknesses.			
31.02 Discuss individual interests related to a career.			
31.03 Identify careers within specific areas of technology.			
31.04 Explore careers within specific areas of interest.			
32.0 Demonstrate employability skills. – The student will be able to:			
32.01 Conduct a job search.			
32.02 Secure information about a career.			
32.03 Identify documents that may be required when applying for a job interview.			
32.04 Complete a job application form correctly.			
32.05 Demonstrate competence in job interview techniques.			
32.06 Prepare a resume for a job.			
33.0 Demonstrate an understanding of entrepreneurship. – The student will be able to:			
33.01 Define entrepreneurship.			
33.02 Describe the importance of entrepreneurship to the American economy.			
33.03 List the advantages and disadvantages of business ownership.			
33.04 Identify the risks involved in ownership of a business.			
33.05 Identify the necessary personal characteristics of a successful entrepreneur.			
33.06 Identify the business skills needed to operate a small business efficiently and effectively.			
34.0 Make an informed and meaningful career choice. – The student will be able to:			
34.01 Make a tentative occupational choice based on the information learned and interest developed in this course.			
34.02 Review tentative occupational choices based on the information learned and interest developed in this course.			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
48.0	Demonstrate knowledge and application of mechanical systems. – The student will be able to:			
48.01	Define the concepts of force, work, rate, resistance, energy and power as they relate to mechanical systems.			
48.02	Diagram a mechanical system incorporating input, monitoring, controlling, output, and feedback.			
48.03	Report on the six simple machines.			
48.04	Identify various parts of a mechanical system.			
48.05	Assemble and operate the six simple machines.			
48.06	Use the problem-solving model - perform activities using combinations of the six simple machines to meet the described design criteria.			
48.07	Demonstrate the use of a computer to control a mechanical system.			
49.0	Demonstrate knowledge and application of fluid systems. – The student will be able to:			
49.01	Define the concepts of force, work rate, resistance, energy and power as they relate to fluid systems.			
49.02	Diagram a fluid system incorporating input, monitoring, controlling, output, and feedback.			
49.03	Diagram a fluid power system incorporating input, monitoring, controlling, output, and feedback.			
49.04	Use the problem-solving model - perform activities using fluid power components to meet the described design criteria.			
49.05	Assemble, operate, and identify the parts of a fluid power system.			
49.06	Report on the applications of fluid power used in technology.			
49.07	Demonstrate the use of a computer to control a fluid power system.			
50.0	Demonstrate knowledge and application of electrical systems. – The student will be able to:			
50.01	Define the concepts of force, work, rate resistance, energy, and power as they relate to electrical systems.			
50.02	Diagram an electrical system incorporating input, monitoring, controlling, output and feedback components.			
50.03	Explain what a system and sub-system is.			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
50.04	Describe types of electrical outputs of heat, light, temperature, sound, magnetism, and electrical voltage.			
50.05	Describe types of electrical inputs of light, temperature, sound, magnetism, moisture, movement, pressure, and voltage.			
50.06	Use the problem-solving model - perform activities using electrical system components to meet the describe design criteria.			
50.07	Demonstrate the use of a computer to control an electrical system.			
51.0	Demonstrate the use of fiber optics. – The student will be able to:			
51.01	Report on the applications of fiber optics in technology.			
51.02	Use the problem-solving model - perform activities using fiber optics to meet the described design criteria.			
51.03	Assemble, operate, and identify the parts of a fiber optics system.			
52.0	Demonstrate the use of a computer to integrate and control a system composed of mechanical, fluid and electrical systems. – The student will be able to:			
52.01	Diagram an integrated system incorporating input, monitoring, controlling, output and feedback components.			
52.02	Use the problem-solving model - perform activities using integrated systems to meet the described design criteria.			
52.03	Assemble, operate, and identify the parts of integrated systems.			
52.04	Demonstrate the use of a computer to control an integrated system composed of mechanical, fluid and electrical components.			
53.0	Conduct a research and experimentation project on a technological material or process. – The student will be able to:			
53.01	Identify a problem.			
53.02	State a need to research the problem.			
53.03	Form a hypothesis about the problem.			
53.04	Plan the procedures for researching the problem.			
53.05	Conduct the research following the planned procedures.			

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci	National Standards
53.06 Present the research findings in a seminar.			
53.07 State conclusions based on the research findings.			

Additional Information

Laboratory Activities

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

Career and Technical Student Organization (CTSO)

The Florida Technology Student Association (FL-TSA) is the intercurricular career and technical student organization for providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

Cooperative Training – OJT

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

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 Occupational Completion Point (OCP) or a Modified Occupational Completion Point (MOCP). If needed, a student may enroll in the same career and technical course more than once. Documentation should be included in the IEP that clearly indicates that it is anticipated that the student may need an additional year to complete an OCP/MOCP. The student should work on different competencies and new applications of competencies each year toward completion of the OCP/MOCP. After achieving the competencies identified for the year, the student earns credit for the course. It is important to ensure that credits earned by students are reported accurately. The district's information system must be designed to accept multiple credits for the same course number for eligible students with disabilities.

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

Florida Department of Education
Curriculum Framework

Course Title: **Exploring Technology and Career Planning**
Course Type: **Orientation/Exploratory and Career Planning**
Career Cluster: **Engineering & Technology Education**

Secondary – Middle School	
Course Number	8600220
CIP Number	08210122CP
Grade Level	6 - 8
Standard Length	Semester
Teacher Certification	TEC ED 1 @2 ENG @7 7G
CTSO	Florida Technology Student Association (FL-TSA)
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

The purpose of this course is to give students an opportunity to explore the area of production technology and its associated careers. Course requirements are consistent with 8600020 Exploring Technology with the addition of the career and education planning course requirements. Students will be given the opportunity to solve technological problems using a variety of tools, materials, processes and systems while gaining an understanding of the effects of production technology on our everyday lives.

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

Program Structure

The lengths of these courses are one semester. The same course may be offered for two semesters when appropriate. When offered for one semester, it is recommended that it be at the exploratory level and more in-depth when offered for two semesters.

Standards

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

01.0 Demonstrate an understanding of the characteristics and scope of technology.
02.0 Demonstrate an understanding of the core concepts of technology.
03.0 Demonstrate an understanding of the relationships among technologies and the connection between technology and other fields of study.
04.0 Demonstrate an understanding of the cultural, social, economic, and political effects of technology.
05.0 Demonstrate an understanding of the effects of technology on the environment.
06.0 Demonstrate an understanding of the role of society in the development and use of technology.
07.0 Demonstrate an understanding of the influence of history on technology.
08.0 Demonstrate an understanding of the attributes of design.
09.0 Demonstrate an understanding of engineering design.
10.0 Demonstrate an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving.
11.0 Demonstrate the abilities to apply the design process.
12.0 Demonstrate the abilities to use and maintain technological products and systems.
13.0 Demonstrate the abilities to assess the impact of products and systems.
14.0 Demonstrate an understanding of and be able to select and use medical technologies.
15.0 Demonstrate an understanding of and be able to select and use agricultural and related biotechnologies.
16.0 Demonstrate an understanding of and be able to select and use energy and power technologies.
17.0 Demonstrate an understanding of and be able to select and use information and communication technologies.
18.0 Demonstrate an understanding of and be able to select and use transportation technologies.
19.0 Demonstrate an understanding of and be able to select and use manufacturing technologies.
20.0 Demonstrate an understanding of and be able to select and use construction technologies.
21.0 Demonstrate proper and safe procedures while working with technological tools, apparatus, equipment, systems, and materials.
22.0 Exhibit positive human relations and leadership skills.
23.0 Discuss individual interests, aptitudes, and opportunities as they relate to a career.

Listed below are the course outcomes that must be met to satisfy the requirements of Section 1003.4156, Florida Statutes.

24.0 Describe the influences that societal, economic, and technological changes have on employment trends and future training.
25.0 Develop skills to locate, evaluate, and interpret career information.
26.0 Identify and demonstrate processes for making short and long term goals.
27.0 Demonstrate employability skills such as working in a group, problem-solving and organizational skills, and the importance of entrepreneurship.
28.0 Understand the relationship between educational achievement and career choices/postsecondary options.
29.0 Identify a career cluster and related pathways that match career and education goals.
30.0 Develop a career and education plan that includes short and long-term goals, high school program of study, and postsecondary/career goals.
31.0 Demonstrate knowledge of technology and its application in career fields/clusters.

Florida Department of Education
Student Performance Standards

Course Title: **Exploring Technology and Career Planning**
Course Number: **8600220**
Course Length: **Semester**

CTE Standards and Benchmarks	
01.0	Demonstrate an understanding of the characteristics and scope of technology. – The student will be able to:
01.01	Develop new products and systems to solve problems or to help do things that could not be done without the help of technology.
01.02	Describe the development of technology as a human activity that is the result of individual or collective needs and the ability to be creative.
01.03	Explain how technology is closely linked with creativity, which has resulted in innovation.
01.04	Demonstrate how corporations can often create demand for a product by bringing it onto the market and advertising it.
02.0	Demonstrate an understanding of the core concepts of technology. – The student will be able to:
02.01	Describe technological systems including input, processes, output, and, at times, feedback.
02.02	Apply systems thinking, involving considering how every part relates to others.
02.03	Identify control systems having no feedback path and requiring human intervention, and control systems using feedback.
02.04	Explain how technological systems can be connected to one another.
02.05	Repair malfunctions of any part of a system that may affect the function and quality of the system.
02.06	Compare and contrast requirements or parameters placed on the development of a product or system.
02.07	Compare and contrast trade-offs as a decision process recognizing the need for careful compromises among competing factors.
02.08	Describe different technologies that involve different sets of processes.
02.09	Perform basic maintenance as the process of inspecting and servicing a product or system on a regular basis in order for it to continue functioning properly, to extend its life, or to upgrade its capability.
02.10	Utilize controls and mechanisms or particular steps that people perform using information about the system that causes systems to change.
03.0	Demonstrate an understanding of the relationships among technologies and the connection between technology and other fields of study. --The student will be able to:
03.01	Modify the way technological systems interact with one another.

CTE Standards and Benchmarks	
	03.02 Apply a product, system, or environment developed for one setting in another setting.
	03.03 Explain how knowledge gained from other fields of study has a direct effect on the development of technological products and systems.
04.0	Demonstrate an understanding of the cultural, social, economic, and political effects of technology. – The student will be able to:
	04.01 Describe ethical issues associated with the development and use of technology.
	04.02 Describe the economic, political, and cultural issues that are influenced by the development and use of technology.
05.0	Demonstrate an understanding of the effects of technology on the environment. – The student will be able to:
	05.01 Describe the management of waste produced by technological systems as an important societal issue.
	05.02 Describe how technologies can be used to repair damage caused by natural disasters and to break down waste from the use of various products and systems.
	05.03 Make decisions about the development and use of technologies that put environmental and economic concerns in direct competition with one another.
06.0	Demonstrate an understanding of the role of society in the development and use of technology. – The student will be able to:
	06.01 Describe the development of technologies that has resulted from the demands, values, and interests of individuals, businesses, industries, and societies.
	06.02 Describe changes in society and the creation of new needs and wants caused by the use of inventions and innovations.
	06.03 Describe social and cultural priorities and values that are reflected in technological devices.
	06.04 Explain how meeting societal expectations is the driving force behind the acceptance and use of products and systems.
07.0	Demonstrate an understanding of the influence of history on technology. – The student will be able to:
	07.01 Describe inventions and innovations that have evolved by using slow and methodical processes of tests and refinements.
	07.02 Explain how the specialization of function has been at the heart of many technological improvements.
	07.03 Describe the design and construction of structures for service or convenience evolving from the development of techniques for measurement, controlling systems, and the understanding of spatial relationships.
08.0	Demonstrate an understanding of the attributes of design. – The student will be able to:
	08.01 Use design as a creative planning process that leads to useful products and systems.
	08.02 Explain why there is no perfect design.
	08.03 Evaluate criteria and constraints that are requirements for a design.

CTE Standards and Benchmarks	
09.0	Demonstrate an understanding of engineering design. – The student will be able to:
09.01	Utilize the design process involving a set of steps, which can be performed in different sequences and repeated as needed.
09.02	Employ brainstorming as a group problem-solving design process in which each person in the group presents his or her ideas in an open forum.
09.03	Model, test, evaluate and modify designs to transform ideas into practical solutions.
10.0	Demonstrate an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving. – The student will be able to:
10.01	Use troubleshooting as a problem-solving method used to identify the cause of a malfunction in a technological system.
10.02	Describe invention as a process of turning ideas and imagination into devices and systems and innovation as the process of modifying an existing product or system to improve it.
10.03	Identify technological problems that are best solved through experimentation.
11.0	Demonstrate the abilities to apply the design process. – The student will be able to:
11.01	Apply a design process to solve problems in and beyond the laboratory-classroom.
11.02	Specify criteria and constraints for the design.
11.03	Make two-dimensional and three-dimensional representations of the designed solution.
11.04	Test and evaluate the design in relation to pre-established requirements, such as criteria and constraints, and refine as needed.
11.05	Make a product or system and document the solution.
12.0	Demonstrate the abilities to use and maintain technological products and systems. – The student will be able to:
12.01	Use information provided in manuals, protocols, or by experienced people to see and understand how things work.
12.02	Use tools, materials, and machines safely to diagnose, adjust, and repair systems.
12.03	Use computers and calculators in various applications.
12.04	Operate and maintain systems in order to achieve a given purpose.
13.0	Demonstrate the abilities to assess the impact of products and systems. – The student will be able to:
13.01	Design and use instruments to gather data.
13.02	Use data collected to analyze and interpret trends in order to identify the positive or negative effects of a technology.

CTE Standards and Benchmarks	
	13.03 Identify trends and monitor potential consequences of technological development.
	13.04 Interpret and evaluate the accuracy of the information obtained and determine if it is useful.
14.0	Demonstrate an understanding of and be able to select and use medical technologies. – The student will be able to:
	14.01 Describe how advances and innovations in medical technologies are used to improve healthcare.
	14.02 Describe how sanitation processes used in the disposal of medical products help to protect people from harmful organisms and disease, and shape the ethics of medical safety.
	14.03 Explain how the vaccines developed for use in immunization require specialized technologies to support environments in which a sufficient amount of vaccines are produced.
	14.04 Describe genetic engineering involving modifying the structure of DNA to produce novel genetic make-ups.
15.0	Demonstrate an understanding of and be able to select and use agricultural and related biotechnologies. – The student will be able to:
	15.01 Describe technological advances in agriculture directly affecting the time and number of people required to produce food for a large population.
	15.02 Describe how a wide range of specialized equipment and practices is used to improve the production of food, fiber, fuel, and other useful products and in the care of animals.
	15.03 Explain how biotechnology applies the principles of biology to create commercial products or processes.
	15.04 Create artificial ecosystems that are human-made complexes that replicate some aspects of natural environments.
	15.05 Explain how the development of refrigeration, freezing, dehydration, preservation, and irradiation provide long-term storage of food and reduce the health risks caused by tainted food.
16.0	Demonstrate an understanding of and be able to select and use energy and power technologies. – The student will be able to:
	16.01 Define energy as the capacity to do work.
	16.02 Explain how energy can be used to do work, using many processes.
	16.03 Define power as the rate at which energy is converted from one form to another or transferred from one place to another, or the rate at which work is done.
	16.04 Describe power systems used to drive and provide propulsion to other technological products and systems.
	16.05 Explain how much of the energy used in our environment is not used efficiently.
17.0	Demonstrate an understanding of and be able to select and use information and communication technologies. – The student will be able to:
	17.01 Create information and communication systems that allow information to be transferred from human to human, human to machine, machine to machine, and machine to human.
	17.02 Describe communication systems made up of a source, encoder, transmitter, receiver, decoder, and destination.

CTE Standards and Benchmarks	
	17.03 Consider factors that influence the design of a message, such as the intended audience, medium, purpose, and nature of the message.
	17.04 Use symbols, measurements, and drawings to promote clear communication by providing a common language to express ideas.
18.0	Demonstrate an understanding of and be able to select and use transportation technologies. – The student will be able to:
	18.01 Describe how transporting people and goods involve a combination of individuals and vehicles.
	18.02 Describe subsystems of transportation vehicles, such as structural, propulsion, suspension, guidance, control, and support that must function together for a system to work effectively.
	18.03 Identify governmental regulations that influence the design and operation of transportation systems.
	18.04 Identify processes, such as receiving, holding, storing, loading, moving, unloading, delivering, evaluating, marketing, managing, communicating, and using conventions that are necessary for the entire transportation system to operate efficiently.
19.0	Demonstrate an understanding of and be able to select and use manufacturing technologies. – The student will be able to:
	19.01 Describe manufacturing systems using mechanical processes that change the form of materials through processes of separating, forming, combining, and conditioning them.
	19.02 Classify manufactured goods as durable and non-durable.
	19.03 Employ the manufacturing process including the designing, development, making, and servicing of products and systems.
	19.04 Describe manufacturing technologies that are used to modify or alter manufactured products.
	19.05 Explain that materials must first be located before they can be extracted from the earth through processes such as harvesting, drilling, and mining.
20.0	Demonstrate an understanding of and be able to select and use construction technologies. – The student will be able to:
	20.01 Research building laws and codes.
	20.02 Identify factors such as style, convenience, cost, climate, and function in the selection of designs for structures.
	20.03 Explain that structures rest on a foundation.
	20.04 Classify structures as temporary or permanent.
	20.05 Describe subsystems of a building.
21.0	Demonstrate proper and safe procedures while working with technological tools, apparatus, equipment, systems, and materials. – The student will be able to:
	21.01 Follow laboratory safety rules and procedures.
	21.02 Demonstrate good housekeeping at workstations within a total laboratory.

CTE Standards and Benchmarks	
21.03	Conduct laboratory activities and equipment operations in a safe manner.
21.04	Identify tools, machines, materials and equipment and describe their functions.
21.05	Select appropriate tools, machines, and equipment to accomplish a given task.
21.06	Demonstrate safe and correct use of tools, machines, and equipment.
21.07	Identify color-coding safety standards.
21.08	Explain fire prevention and safety precautions and practices for extinguishing fires.
21.09	Identify harmful effects/potential dangers of familiar hazardous substances/devices to people and the environment.
22.0	Exhibit positive human relations and leadership skills--The student will be able to:
22.01	Perform roles in a student personnel system or in the Florida Technology Student Association (FL-TSA).
22.02	Work cooperatively with others.
23.0	Discuss individual interests, aptitudes, and opportunities as they relate to a career--The student will be able to:
23.01	Identify individual strengths and weaknesses.
23.02	Discuss individual interests related to a career.
23.03	Identify careers within specific areas of technology.
23.04	Explore careers within specific areas of interest.
23.05	Form an understanding and appreciation for work after listening to or observing technology workers.
23.06	Form an understanding and appreciation for work after participating in a simulated technology group project in the laboratory.
23.07	Form an understanding and appreciation for the roles and work of co-workers.
Listed below are the standards that must be met to satisfy the requirements of Section 1003.4156, Florida Statutes--The student will be able to:	
24.0	Describe the influences that societal, economic, and technological changes have on employment trends and future training.
25.0	Develop skills to locate, evaluate, and interpret career information.
26.0	Identify and demonstrate processes for making short and long term goals.
27.0	Demonstrate employability skills such as working in a group, problem-solving and organizational skills, and the importance of entrepreneurship.

CTE Standards and Benchmarks	
28.0	Understand the relationship between educational achievement and career choices/postsecondary options.
29.0	Identify a career cluster and related pathways through an interest assessment that match career and education goals.
30.0	Develop a career and education plan that includes short and long-term goals, high school program of study, and postsecondary/career goals.
31.0	Demonstrate knowledge of technology and its application in career fields/clusters.

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.

Special Notes

The lengths of these courses are one semester. The same course may be offered for two semesters when appropriate. When offered for one semester, it is recommended that it be at the exploratory level and more in-depth when offered for two semesters.

Career Planning

The requirements of section 1003.4156 (1) (e), Florida Statutes, have been integrated into this course. The statute requires that students take a career and education planning course that must result in a completed personalized academic and career plan for the student; must emphasize the importance of entrepreneurship skills; must emphasize technology or the application of technology in career fields; and, beginning in the 2014-2015 academic year, must provide information from the Department of Economic Opportunity's economic security report as described in section 445.07, Florida Statutes. For additional information on the Middle School Career and Education Planning course requirements, go to http://www.fldoe.org/workforce/ced/.

Career and Technical Student Organization (CTSO)

The Florida Technology Student Association (FL-TSA) is the intercurricular career and technical student organization for providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

Accommodations

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

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

Florida Department of Education
Curriculum Framework

Program Title: **Technology Systems**
Program Type: **Non Career Preparatory**
Career Cluster: **Engineering & Technology Education**

Secondary – Non Career Preparatory	
Program Number	8600400
CIP Number	08210128PA
Grade Level	9-12; 30, 31
Standard Length	Max of 4 credits (.5 credit for each course)
Teacher Certification	See individual course frameworks.
CTSO	Florida Technology Student Association (FL-TSA)
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 the applications of technology and its effect upon our lives and the choosing of an occupation. Students will be introduced to the concepts that underlie technological systems and the influence of technological systems at home, school, and the world of work. This program focuses on transferable skills and stresses understanding and demonstration of the technological tolls, machines, instruments, materials, processes and systems in business and industry.

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

Program Structure

This program is a planned sequence of instruction consisting of the courses shown in the following table:

Course Number	Course Title	Length	Level	Graduation Requirement
8600410	Communication Systems	.5 credit	2	PA
8600420	Power and Transportation Systems	.5 credit	2	VO
8600430	Production Systems	.5 credit	2	VO
8600440	Drafting/Illustrative Design Systems	.5 credit	2	PA
8600450	Electronics Systems	.5 credit	2	VO
8600460	Engineering Systems	.5 credit	2	VO
8600470	Applied Technology Systems	.5 credit	2	VO
8600480	Home Technology Systems	.5 credit	2	VO

(Graduation Requirement Abbreviations- EQ= Equally Rigorous Science, PA= Practical Arts, EC= Economics, VO= Career and Technical Education)

NOTE: If the majority of the students enrolled in a course are 9th and/or 10th graders, the Florida Standards for Technical Subjects 01.0, 02.0, and 03.0 must be used in conjunction with the standards outlined in that course.

NOTE: If the majority of the students enrolled in a course are 11th and/or 12th graders, the Florida Standards for Technical Subjects 04.0, 05.0, and 06.0 must be used in conjunction with the standards outlined in that course.

Academic Alignment Table

Academic alignment is an ongoing, collaborative effort of professional educators specializing in the fields of science, mathematics, English/language arts, and Career and Technical Education (CTE). This initiative supports CTE programs by improving student performance through the integration of academic content within CTE courses. Career and Technical Education courses that have been aligned to the Next Generation Sunshine State Standards for Science and the Florida Standards for Mathematics and English/Language Arts will show the following data: the quantity of academic standards in the CTE course; the total number of standards contained in the academic course; and the percentage of alignment to the CTE course.

Courses	Anatomy/ Physiology Honors	Astronomy Solar/Galactic Honors	Biology 1	Chemistry 1	Earth-Space Science	Environmental Science	Genetics	Integrated Science	Marine Science 1 Honors	Physical Science	Physics 1
8600410	**	**	**	**	**	**	**	**	**	**	**
8600420	**	**	**	**	**	**	**	**	**	**	**
8600430	**	**	**	**	**	**	**	**	**	**	**
8600440	**	**	**	**	**	**	**	**	**	**	**
8600450	**	**	**	**	**	**	**	**	**	**	**

Courses	Anatomy/ Physiology Honors	Astronomy Solar/Galactic Honors	Biology 1	Chemistry 1	Earth-Space Science	Environmental Science	Genetics	Integrated Science	Marine Science 1 Honors	Physical Science	Physics 1
8600460	**	**	**	**	**	**	**	**	**	**	**
8600470	**	**	**	**	**	**	**	**	**	**	**
8600480	**	**	**	**	**	**	**	**	**	**	**

** *Alignment pending review* # *Alignment attempted, but no correlation to academic course*

Courses	Algebra 1	Algebra 2	Geometry	English 1	English 2	English 3	English 4
8600410	**	**	**	**	**	**	**
8600420	**	**	**	**	**	**	**
8600430	**	**	**	**	**	**	**
8600440	**	**	**	**	**	**	**
8600450	**	**	**	**	**	**	**
8600460	**	**	**	**	**	**	**
8600470	**	**	**	**	**	**	**
8600480	**	**	**	**	**	**	**

** *Alignment pending review* # *Alignment attempted, but no correlation to academic course*

Florida Standards for Technical Subjects

Florida Standards (FS) for English Language Arts and Literacy in History/Social Studies, Science, and Technical Subjects are the critical reading and writing literacy standards designed for grade 6 and above. These standards are predicated on teachers of history/social studies, science, and technical subjects using their content area expertise to help students meet the particular challenges of reading, writing, speaking, listening, and language in their respective fields. It is important to note that the 6-12 literacy standards in history/social studies, science, and technical subjects are not meant to replace content standards in those areas but rather to supplement them.

This curriculum framework incorporates the grades 9-10 reading and writing literacy standards of this CTE program and grade 11-12 reading and writing literacy standards of this CTE program. The standards for Mathematical Practices describe varieties of expertise that educators at all levels should seek to develop in their students. These practices rest on important "processes and proficiencies" with longstanding importance in mathematics education. This curriculum framework incorporates the appropriate mathematical practices in the first four courses of this CTE program.

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:

NOTE: If the majority of the students enrolled in a course are 9th and/or 10th graders, the Florida Standards for Technical Subjects 01.0, 02.0, and 03.0 must be used in conjunction with the standards outlined in that course.

01.0 Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Technology Systems.
02.0 Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Technology Systems.
03.0 Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Technology Systems.

NOTE: If the majority of the students enrolled in a course are 11th and/or 12th graders, the Florida Standards for Technical Subjects 04.0, 05.0, and 06.0 must be used in conjunction with the standards outlined in that course.

04.0 Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Technology Systems.
05.0 Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Technology Systems.
06.0 Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Technology Systems.

07.0 Demonstrate the ability to work safely with a variety of Technologies.
08.0 Demonstrate interpersonal skills as they relate to the workplace.
09.0 Identify and apply methods of information acquisition and utilization's.
10.0 Apply basic skills in communications mathematics, and science appropriate to technological content and learning activities.
11.0 Demonstrate and apply design/problem-solving processes.
12.0 Express an understanding of technology systems and their complex interrelationships.
13.0 Demonstrate the ability to properly identify, organize, plan and allocate resources.

Communication Systems – 8600410

14.0 Demonstrate technological literacy about communications systems.
15.0 Apply communications technology skills.

Power and Transportation Systems – 8600420

16.0 Describe sources of energy.
17.0 Describe the application of energy to power and transportation systems.
18.0 Apply technology skills to a selected power or transportation system.

Production Systems – 8600430

19.0 Demonstrate knowledge of the production systems found in modern industries.
20.0 Define the processes related to materials utilized in manufacturing and production.
21.0 Plan and develop a system to produce a product from available materials.

Drafting/Illustrative Design Systems – 8600440

22.0 Demonstrate proper and safe procedures and technical knowledge and skills in the use and care of drafting instruments, materials equipment.
23.0 Demonstrate technical knowledge skills and applications common to all types of drafting including CAD.
24.0 Demonstrate technical knowledge and skills for making drafting sketches.
25.0 Demonstrate technical knowledge and skills for making three-view orthographic drawings.
26.0 Demonstrate technical knowledge and skills for making oblique pictorial drawings.
27.0 Demonstrate technical knowledge and skills for making isometric pictorial drawings.
28.0 Demonstrate technical knowledge and skills for making aerodynamic drawings.
29.0 Demonstrate technical knowledge and skills for making a CAD drawing.
30.0 Demonstrate technical knowledge and skills for reproducing a CAD drawing on a plotter.

Electronics Systems – 8600450

31.0 Apply electricity/electronics technology skills.
32.0 Demonstrate technological literacy about electricity/electronics systems.
33.0 Demonstrate knowledge of the role electronics plays in magnetic, optical, fluid and mechanical control systems.

Engineering Systems – 8600460

34.0 Demonstrate the engineering analysis and design methods.
35.0 Communicate through oral, written or graphic means the results of solutions or designs.
36.0 Demonstrate and apply mechanical, fluid, electrical and thermal system principles.
37.0 Demonstrate knowledge of materials and processes.
38.0 Use tools, machines, calculators, and computers necessary for obtaining solutions to design problems.
39.0 Describe the functional characteristics of the engineering design team.

Applied Technology Systems – 8600470

40.0 Discuss the impact of technology on society and the environment.
41.0 Demonstrate and apply mechanical system principles.
42.0 Demonstrate and apply fluid system principles.
43.0 Demonstrate and apply electrical system principles.
44.0 Demonstrate and apply thermal system principles.
45.0 Demonstrate the use of a computer to integrate and control a system composed of mechanical, fluid and electrical systems.
46.0 Demonstrate the use of sensors to control systems.
47.0 Demonstrate the use of fiber optics concepts.
48.0 Demonstrate the use of laser optic concepts.

Home Technology Systems – 8600480

49.0 Identify and list the different systems found in the new homes under construction today.

50.0 Draw up a bill of materials required to repair a selected component of a unit in a home technology system.

51.0 Apply home maintenance technology skills to a selected system requiring repair.

Florida Department of Education
Student Performance Standards

Florida Standards for Technical Subjects

NOTE: Standards 01.0, 02.0, and 03.0 must be used when the following courses are used where the majority of the students enrolled are 9th and/or 10th graders.

Course Number	Course Title
8600410	Communication Systems
8600420	Power and Transportation Systems
8600430	Production Systems
8600440	Drafting/Illustrative Design Systems
8600450	Electronics Systems
8600460	Engineering Systems
8600470	Applied Technology Systems
8600480	Home Technology Systems

Florida Standards			Correlation to CTE Program Standard #
01.0	Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Technology Systems.		
	01.01 Key Ideas and Details		
	01.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. LAFS.910.RST.1.1	
	01.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.910.RST.1.2	
	01.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.910.RST.1.3	
	01.02 Craft and Structure		

Florida Standards			Correlation to CTE Program Standard #
	01.02.1	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. LAFS.910.RST.2.4	
	01.02.2	Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). LAFS.910.RST.2.5	
	01.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. LAFS.910.RST.2.6	
01.03	Integration of Knowledge and Ideas		
	01.03.1	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. LAFS.910.RST.3.7	
	01.03.2	Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. LAFS.910.RST.3.8	
	01.03.3	Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. LAFS.910.RST.3.9	
01.04	Range of Reading and Level of Text Complexity		
	01.04.1	By the end of grade 9, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	01.04.2	By the end of grade 10, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 9–10 text complexity band independently and proficiently. LAFS.910.RST.4.10	
02.0	Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Technology Systems.		
02.01	Text Types and Purposes		
	02.01.1	Write arguments focused on discipline-specific content. LAFS.910.WHST.1.1	

Florida Standards		Correlation to CTE Program Standard #
02.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.910.WHST.1.2	
02.02	Production and Distribution of Writing	
02.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.910.WHST.2.4	
02.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.910.WHST.2.5	
02.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. LAFS.910.WHST.2.6	
02.03	Research to Build and Present Knowledge	
02.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.910.WHST.3.7	
02.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. LAFS.910.WHST.3.8	
02.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.910.WHST.3.9	
02.04	Range of Writing	
02.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.910.WHST.4.10	

Florida Standards		Correlation to CTE Program Standard #
03.0	Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Technology Systems.	
	03.01 Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	
	03.02 Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
	03.03 Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
	03.04 Model with mathematics. MAFS.K12.MP.4.1	
	03.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
	03.06 Attend to precision. MAFS.K12.MP.6.1	
	03.07 Look for and make use of structure. MAFS.K12.MP.7.1	
	03.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Florida Department of Education
Student Performance Standards

Florida Standards for Technical Subjects

NOTE: Standards 04.0, 05.0, and 06.0 must be used when the following courses are used where the majority of the students enrolled are 11th and/or 12th graders.

Course Number	Course Title
8600410	Communication Systems
8600420	Power and Transportation Systems
8600430	Production Systems
8600440	Drafting/Illustrative Design Systems
8600450	Electronics Systems
8600460	Engineering Systems
8600470	Applied Technology Systems
8600480	Home Technology Systems

Florida Standards			Correlation to CTE Program Standard #
04.0	Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Technology Systems.		
	04.01 Key Ideas and Details		
	04.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. LAFS.1112.RST.1.1	
	04.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.1112.RST.1.2	
	04.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.1112.RST.1.3	
	04.02 Craft and Structure		

Florida Standards			Correlation to CTE Program Standard #
	04.02.1	Determine the meaning of symbols key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. LAFS.1112.RST.2.4	
	04.02.2	Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. LAFS.1112.RST.2.5	
	04.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. LAFS.1112.RST.2.6	
	04.03	Integration of Knowledge and Ideas	
	04.03.1	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g. quantitative data, video, multimedia) in order to address a question or solve a problem. LAFS.1112.RST.3.7	
	04.03.2	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. LAFS.1112.RST.3.8	
	04.03.3	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. LAFS.1112.RST.3.9	
	04.04	Range of Reading and Level of Text Complexity	
	04.04.1	By the end of grade 11, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	04.04.2	By the end of grade 12, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 11–CCR text complexity band independently and proficiently. LAFS.1112.RST.4.10	
05.0	Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Technology Systems.		
	05.01	Text Types and Purposes	

Florida Standards		Correlation to CTE Program Standard #
05.01.1	Write arguments focused on discipline-specific content. LAFS.1112.WHST.1.1	
05.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.1112.WHST.1.2	
05.02	Production and Distribution of Writing	
05.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.1112.WHST.2.4	
05.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.1112.WHST.2.5	
05.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. LAFS.1112.WHST.2.6	
05.03	Research to Build and Present Knowledge	
05.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.1112.WHST.3.7	
05.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. LAFS.1112.WHST.3.8	
05.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.1112.WHST.3.9	
05.04	Range of Writing	
05.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.1112.WHST.4.10	

Florida Standards		Correlation to CTE Program Standard #
06.0	Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Technology Systems.	
06.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	
06.02	Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
06.03	Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
06.04	Model with mathematics. MAFS.K12.MP.4.1	
06.05	Use appropriate tools strategically. MAFS.K12.MP.5.1	
06.06	Attend to precision. MAFS.K12.MP.6.1	
06.07	Look for and make use of structure. MAFS.K12.MP.7.1	
06.08	Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Florida Department of Education
Student Performance Standards

Course Title: **Communications Systems**
Course Number: **8600410**
Course Credit: **.5 Credit**
Teacher Certification: **TEC ED 1 @2** **GRAPH ARTS @4**
COMM ART @7 7G **PRINTING @7 7G**

NOTE: If the majority of the students enrolled in this course are 9th and/or 10th graders, the Florida Standards for Technical Subjects 01.0, 02.0, and 03.0 must be used in conjunction with the standards outlined in this course.

NOTE: If the majority of the students enrolled in this course are 11th and/or 12th graders, the Florida Standards for Technical Subjects 04.0, 05.0, and 06.0 must be used in conjunction with the standards outlined in this course.

Course Description:
The purpose of this course is to provide students with a foundation of knowledge and technically oriented experiences in the study of communications systems.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
07.0	Demonstrate the ability to work safely with a variety of technologies--The student will be able to:		
07.01	Select appropriate tools, procedures, and/or equipment needed to produce a product.		
07.02	Demonstrate the safe usage of appropriate tools, procedures, and operation of equipment needed to produce a product.		
07.03	Demonstrate knowledge required to maintain and troubleshoot.		
07.04	Follow laboratory safety rules and procedures.		
07.05	Demonstrate good housekeeping at work state and within total laboratory.		
07.06	Identify color-coding safety standards.		
07.07	Explain fire prevention and safety precautions and practices for extinguishing fires.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	07.08 Identify harmful effects/potential dangers of familiar hazardous substances/devices to people and the environment.		
08.0	Demonstrate interpersonal skills as they relate to the workplace--The student will be able to:		
	08.01 Perform roles in a student personnel system or in the Florida Technology Student Association (FL-TSA).		
	08.02 Participate as a member of a team.		
	08.03 Teach others new skills.		
	08.04 Identify skills needed to serve clients/customers.		
	08.05 Demonstrate leadership skills.		
	08.06 Describe strategies necessary for negotiating agreements.		
	08.07 Demonstrate the application of skills necessary to work with people of diverse backgrounds.		
	08.08 Form an understanding and appreciation for work after listening to or observing technology workers.		
	08.09 Form an understanding and appreciation for work after participating in a simulated technology group project in the laboratory.		
	08.10 Form an understanding and appreciation for the roles and work of co-workers.		
09.0	Identify and apply methods of information acquisition and utilizations--The student will be able to:		
	09.01 Define terms related to computers.		
	09.02 Identify and describe methods of information acquisition and evaluation.		
	09.03 Discuss advantages and disadvantages in the application of technologies.		
	09.04 Produce a plan to organize and maintain information relevant to emerging technologies.		
	09.05 Comprehend and communicate information relevant to emerging technologies.		
	09.06 Demonstrate the use of computers to process information.		
10.0	Apply basic skills in communications, mathematics, and science appropriate to technological content and learning activities--The student will be able to:		
	10.01 Identify and explain the main and subordinate ideas in a written work.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
10.02	Distinguish different purposes and methods of writing, identify a writer's point of view and tone, and interpret a writer's meaning.		
10.03	Define unfamiliar words by use of structural analysis, decoding, contextual clues, or by using a dictionary.		
10.04	Distinguish fact from opinion.		
10.05	Read critically by asking pertinent questions, by recognizing assumptions and implications, and by evaluating ideas.		
10.06	Select, relate, and organize, ideas using outlining and/or graphic organizers and develop the ideas in coherent paragraphs.		
10.07	Improve one's own writing by restructuring, correcting errors, and rewriting.		
10.08	Gather and organize information from primary and secondary sources; write a report using this research; quote, paraphrase, and summarize accurately; and cite sources properly.		
10.09	Vary one's writing style, including vocabulary and sentence structure, for different readers and purposes.		
10.10	Write logical and understandable statements, or phrases, to accurately fill out commonly used forms.		
10.11	Compose unified and coherent correspondence, directions, descriptions, explanations and reports.		
10.12	Participate critically and constructively in the exchange of ideas, particularly during class discussions and conferences with instructors.		
10.13	Conceive and develop ideas about a topic for the purpose of speaking to a group; choose and organize related ideas; present them clearly in Standard English; and evaluate similar presentations by others.		
10.14	Use the mathematics of: integers, fractions, and decimals; ratios, proportions, and percentages; roots and powers; algebra; and geometry.		
10.15	Make estimates and approximations, and judge the reasonableness of a result.		
10.16	Use elementary concepts of probability and statistics.		
10.17	Draw, read, and analyze graphs, charts, and tables.		
10.18	Ask appropriate scientific questions and recognize what is involved in experimental approaches to the solutions of such questions through familiarity with laboratory and fieldwork.		
10.19	Organize and communicate the results obtained by observation and experimentation.		
10.20	Apply the basic principles of biology, physics, and chemistry: (properties of matter; structure of compounds; concepts of motion; temperature, pressure and volume; work, power, force and energy; machines; human cell structure).		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
10.21	Identify problems rooted in basic biology, physics, or chemistry (effects of hazardous materials on health and safety, effects of drugs on health, troubleshooting problems on a machine).		
11.0	Demonstrate and apply design/problem-solving processes--The student will be able to:		
11.01	Describe and explain steps in the design/problem-solving process.		
11.02	Propose solutions to given problems.		
11.03	Design and implement the optimal solution to a given problem.		
11.04	Document each step of the design/problem-solving process.		
11.05	Demonstrate "brainstorming" as a process to solve problems.		
11.06	Define "critical thinking" and its value in the problem-solving process.		
12.0	Express an understanding of technological systems and their complex interrelationships--The student will be able to:		
12.01	Demonstrate knowledge of how social, organizational, and technological systems work.		
12.02	Explore methods used to monitor and correct performance of technological systems.		
12.03	Design and implement an optimal solution to a given problem.		
12.04	Outline major historical technological developments or events.		
12.05	Identify recent advances in technology.		
12.06	Explain problem-solving roles of technology.		
12.07	Forecast a technological development or event.		
12.08	Define technology.		
13.0	Demonstrate the ability to properly identify, organize, plan, and allocate resources--The student will be able to:		
13.01	Demonstrate the ability to select goal-relevant activities, rank them, allocate time, and prepare and follow schedules.		
13.02	Use or prepare budgets, make forecasts, keep records, and make adjustments to meet objectives.		
13.03	Demonstrate the ability to acquire, store, allocate, and use materials or space efficiently.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	13.04 Display knowledge of the efficient use of human resources.		
14.0	Demonstrate technological literacy about communications systems--The student will be able to:		
	14.01 Define communications technology.		
	14.02 Outline major technological developments and events in the history of communications systems technology.		
	14.03 Identify recent advances in communications technology.		
	14.04 Forecast a development or event in communications technology.		
15.0	Apply communications technology skills--The student will be able to:		
	15.01 Explain the processes of relief, gravure, screen process, and lithographic printing; bindery operations; photographic reproduction; and electronic communications.		
	15.02 Demonstrate technical knowledge and skills in the preparation of art and copy for printing reproduction.		
	15.03 Design, layout, and produce a printed product utilizing the above printing processes.		
	15.04 Express knowledge of the basic theory of photography.		
	15.05 Produce a photographic negative and print utilizing the tools, equipment, materials, and processes of photography.		
	15.06 Describe the basic characteristics and specifications of paper, ink, and chemicals used in communications technology.		
	15.07 List ways in which computers are used in communications systems technology.		
	15.08 Operate a computer utilizing a program related to communications technology.		
	15.09 Express a technical knowledge and understanding about electronic communications technology, to include telephone, radio, television, digital data transmission, and satellite communications.		
	15.10 Apply technical knowledge and skills related to one or more of the above areas of electronic communications.		

Florida Department of Education
Student Performance Standards

Course Title: Power and Transportation Systems
Course Number: 8600420
Course Credit: .5 Credit
Teacher Certification: AUTO MECH @7 7G; AUTO IND @7 %7G; AIR MECH @7 7G; TEC ED 1 @2; TEC MECH @7 7G; GASENG RPR @7 7G; TRANSPORT @4 @7 7G; ENG @7 7G; DIESEL MECH @7 7G

NOTE: If the majority of the students enrolled in this course are 9th and/or 10th graders, the Florida Standards for Technical Subjects 01.0, 02.0, and 03.0 must be used in conjunction with the standards outlined in this course.

NOTE: If the majority of the students enrolled in this course are 11th and/or 12th graders, the Florida Standards for Technical Subjects 04.0, 05.0, and 06.0 must be used in conjunction with the standards outlined in this course.

Course Description:
The purpose of this course is to provide students with a foundation of knowledge and technically oriented experiences in the study of power and transportation systems.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
07.0	Demonstrate the ability to work safely with a variety of technologies--The student will be able to:		
07.01	Select appropriate tools, procedures, and/or equipment needed to produce a product.		
07.02	Demonstrate the safe usage of appropriate tools, procedures, and operation of equipment needed to produce a product.		
07.03	Demonstrate knowledge required to maintain and troubleshoot.		
07.04	Follow laboratory safety rules and procedures.		
07.05	Demonstrate good housekeeping at work state and within total laboratory.		
07.06	Identify color-coding safety standards.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	07.07 Explain fire prevention and safety precautions and practices for extinguishing fires.		
	07.08 Identify harmful effects/potential dangers of familiar hazardous substances/devices to people and the environment.		
08.0	Demonstrate interpersonal skills as they relate to the workplace--The student will be able to:		
	08.01 Perform roles in a student personnel system or in the Florida Technology Student Association (FL-TSA).		
	08.02 Participate as a member of a team.		
	08.03 Teach others new skills.		
	08.04 Identify skills needed to serve clients/customers.		
	08.05 Demonstrate leadership skills.		
	08.06 Describe strategies necessary for negotiating agreements.		
	08.07 Demonstrate the application of skills necessary to work with people of diverse backgrounds.		
	08.08 Form an understanding and appreciation for work after listening to or observing technology workers.		
	08.09 Form an understanding and appreciation for work after participating in a simulated technology group project in the laboratory.		
	08.10 Form an understanding and appreciation for the roles and work of co-workers.		
09.0	Identify and apply methods of information acquisition and utilizations--The student will be able to:		
	09.01 Define terms related to computers.		
	09.02 Identify and describe methods of information acquisition and evaluation.		
	09.03 Discuss advantages and disadvantages in the application of technologies.		
	09.04 Produce a plan to organize and maintain information relevant to emerging technologies.		
	09.05 Comprehend and communicate information relevant to emerging technologies.		
	09.06 Demonstrate the use of computers to process information.		
10.0	Apply basic skills in communications, mathematics, and science appropriate to technological content and learning activities--The student will be able to:		
	10.01 Identify and explain the main and subordinate ideas in a written work.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
10.02	Distinguish different purposes and methods of writing, identify a writer's point of view and tone, and interpret a writer's meaning.		
10.03	Define unfamiliar words by use of structural analysis, decoding, contextual clues, or by using a dictionary.		
10.04	Distinguish fact from opinion.		
10.05	Read critically by asking pertinent questions, by recognizing assumptions and implications, and by evaluating ideas.		
10.06	Select, relate, and organize, ideas using outlining and/or graphic organizers and develop the ideas in coherent paragraphs.		
10.07	Improve one's own writing by restructuring, correcting errors, and rewriting.		
10.08	Gather and organize information from primary and secondary sources; write a report using this research; quote, paraphrase, and summarize accurately; and cite sources properly.		
10.09	Vary one's writing style, including vocabulary and sentence structure, for different readers and purposes.		
10.10	Write logical and understandable statements, or phrases, to accurately fill out commonly used forms.		
10.11	Compose unified and coherent correspondence, directions, descriptions, explanations and reports.		
10.12	Participate critically and constructively in the exchange of ideas, particularly during class discussions and conferences with instructors.		
10.13	Conceive and develop ideas about a topic for the purpose of speaking to a group; choose and organize related ideas; present them clearly in Standard English; and evaluate similar presentations by others.		
10.14	Use the mathematics of: integers, fractions, and decimals; ratios, proportions, and percentages; roots and powers; algebra; and geometry.		
10.15	Make estimates and approximations, and judge the reasonableness of a result.		
10.16	Use elementary concepts of probability and statistics.		
10.17	Draw, read, and analyze graphs, charts, and tables.		
10.18	Ask appropriate scientific questions and recognize what is involved in experimental approaches to the solutions of such questions through familiarity with laboratory and fieldwork.		
10.19	Organize and communicate the results obtained by observation and experimentation.		
10.20	Apply the basic principles of biology, physics, and chemistry: (properties of matter; structure of compounds; concepts of motion; temperature, pressure and volume; work, power, force and energy; machines; human cell structure).		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
10.21	Identify problems rooted in basic biology, physics, or chemistry (effects of hazardous materials on health and safety, effects of drugs on health, troubleshooting problems on a machine).		
11.0	Demonstrate and apply design/problem-solving processes--The student will be able to:		
11.01	Describe and explain steps in the design/problem-solving process.		
11.02	Propose solutions to given problems.		
11.03	Design and implement the optimal solution to a given problem.		
11.04	Document each step of the design/problem-solving process.		
11.05	Demonstrate "brainstorming" as a process to solve problems.		
11.06	Define "critical thinking" and its value in the problem-solving process.		
12.0	Express an understanding of technological systems and their complex interrelationships--The student will be able to:		
12.01	Demonstrate knowledge of how social, organizational, and technological systems work.		
12.02	Explore methods used to monitor and correct performance of technological systems.		
12.03	Design and implement an optimal solution to a given problem.		
12.04	Outline major historical technological developments or events.		
12.05	Identify recent advances in technology.		
12.06	Explain problem-solving roles of technology.		
12.07	Forecast a technological development or event.		
12.08	Define technology.		
13.0	Demonstrate the ability to properly identify, organize, plan, and allocate resources--The student will be able to:		
13.01	Demonstrate the ability to select goal-relevant activities, rank them, allocate time, and prepare and follow schedules.		
13.02	Use or prepare budgets, make forecasts, keep records, and make adjustments to meet objectives.		
13.03	Demonstrate the ability to acquire, store, allocate, and use materials or space efficiently.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
13.04 Display knowledge of the efficient use of human resources.		
16.0 Describe sources of energy--The student will be able to:		
16.01 Describe sources of thermal energy.		
16.02 Describe sources of radiant energy.		
16.03 Describe sources of nuclear energy.		
16.04 Describe sources of chemical energy.		
16.05 Describe sources of electrical energy.		
16.06 Describe sources of mechanical energy.		
16.07 Describe sources of fluid energy.		
17.0 Describe the applications of energy to power and transportation systems--The student will be able to:		
17.01 Explain the uses and applications of thermal energy in generating electrical power.		
17.02 Discuss how radiant energy is used in our homes.		
17.03 Describe energy and fuel sources for internal combustion engines.		
17.04 Identify and define key terms, categories and parts of jet engine power systems.		
17.05 Identify and explain the uses of hydraulic power in automotive systems.		
17.06 List the kinds of exhaustible, renewable, and inexhaustible energy resources.		
18.0 Apply technological knowledge and skills to a selected power or transportation system--The student will be able to:		
18.01 Identify a system.		
18.02 Identify an energy source to be used.		
18.03 Plan the procedures for designing the system.		
18.04 Sketch and present the plan to the class.		

Florida Department of Education
Student Performance Standards

Course Title: **Production Systems**
Course Number: **8600430**
Course Credit: **.5 Credit**
Teacher Certification: **TEC ED 1 @2**
ENG @7 7G

NOTE: If the majority of the students enrolled in this course are 9th and/or 10th graders, the Florida Standards for Technical Subjects 01.0, 02.0, and 03.0 must be used in conjunction with the standards outlined in this course.

NOTE: If the majority of the students enrolled in this course are 11th and/or 12th graders, the Florida Standards for Technical Subjects 04.0, 05.0, and 06.0 must be used in conjunction with the standards outlined in this course.

Course Description:
The purpose of this course is to provide students with a foundation of knowledge and technically oriented experiences in the study of production systems and its effect upon our lives and the choosing of an occupation.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
07.0	Demonstrate the ability to work safely with a variety of technologies--The student will be able to:		
07.01	Select appropriate tools, procedures, and/or equipment needed to produce a product.		
07.02	Demonstrate the safe usage of appropriate tools, procedures, and operation of equipment needed to produce a product.		
07.03	Demonstrate knowledge required to maintain and troubleshoot.		
07.04	Follow laboratory safety rules and procedures.		
07.05	Demonstrate good housekeeping at work state and within total laboratory.		
07.06	Identify color-coding safety standards.		
07.07	Explain fire prevention and safety precautions and practices for extinguishing fires.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	07.08 Identify harmful effects/potential dangers of familiar hazardous substances/devices to people and the environment.		
08.0	Demonstrate interpersonal skills as they relate to the workplace--The student will be able to:		
	08.01 Perform roles in a student personnel system or in the Florida Technology Student Association (FL-TSA).		
	08.02 Participate as a member of a team.		
	08.03 Teach others new skills.		
	08.04 Identify skills needed to serve clients/customers.		
	08.05 Demonstrate leadership skills.		
	08.06 Describe strategies necessary for negotiating agreements.		
	08.07 Demonstrate the application of skills necessary to work with people of diverse backgrounds.		
	08.08 Form an understanding and appreciation for work after listening to or observing technology workers.		
	08.09 Form an understanding and appreciation for work after participating in a simulated technology group project in the laboratory.		
	08.10 Form an understanding and appreciation for the roles and work of co-workers.		
09.0	Identify and apply methods of information acquisition and utilizations--The student will be able to:		
	09.01 Define terms related to computers.		
	09.02 Identify and describe methods of information acquisition and evaluation.		
	09.03 Discuss advantages and disadvantages in the application of technologies.		
	09.04 Produce a plan to organize and maintain information relevant to emerging technologies.		
	09.05 Comprehend and communicate information relevant to emerging technologies.		
	09.06 Demonstrate the use of computers to process information.		
10.0	Apply basic skills in communications, mathematics, and science appropriate to technological content and learning activities--The student will be able to:		
	10.01 Identify and explain the main and subordinate ideas in a written work.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
10.02	Distinguish different purposes and methods of writing, identify a writer's point of view and tone, and interpret a writer's meaning.		
10.03	Define unfamiliar words by use of structural analysis, decoding, contextual clues, or by using a dictionary.		
10.04	Distinguish fact from opinion.		
10.05	Read critically by asking pertinent questions, by recognizing assumptions and implications, and by evaluating ideas.		
10.06	Select, relate, and organize, ideas using outlining and/or graphic organizers and develop the ideas in coherent paragraphs.		
10.07	Improve one's own writing by restructuring, correcting errors, and rewriting.		
10.08	Gather and organize information from primary and secondary sources; write a report using this research; quote, paraphrase, and summarize accurately; and cite sources properly.		
10.09	Vary one's writing style, including vocabulary and sentence structure, for different readers and purposes.		
10.10	Write logical and understandable statements, or phrases, to accurately fill out commonly used forms.		
10.11	Compose unified and coherent correspondence, directions, descriptions, explanations and reports.		
10.12	Participate critically and constructively in the exchange of ideas, particularly during class discussions and conferences with instructors.		
10.13	Conceive and develop ideas about a topic for the purpose of speaking to a group; choose and organize related ideas; present them clearly in Standard English; and evaluate similar presentations by others.		
10.14	Use the mathematics of: integers, fractions, and decimals; ratios, proportions, and percentages; roots and powers; algebra; and geometry.		
10.15	Make estimates and approximations, and judge the reasonableness of a result.		
10.16	Use elementary concepts of probability and statistics.		
10.17	Draw, read, and analyze graphs, charts, and tables.		
10.18	Ask appropriate scientific questions and recognize what is involved in experimental approaches to the solutions of such questions through familiarity with laboratory and fieldwork.		
10.19	Organize and communicate the results obtained by observation and experimentation.		
10.20	Apply the basic principles of biology, physics, and chemistry: (properties of matter; structure of compounds; concepts of motion; temperature, pressure and volume; work, power, force and energy; machines; human cell structure).		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	10.21 Identify problems rooted in basic biology, physics, or chemistry (effects of hazardous materials on health and safety, effects of drugs on health, troubleshooting problems on a machine).		
11.0	Demonstrate and apply design/problem-solving processes--The student will be able to:		
	11.01 Describe and explain steps in the design/problem-solving process.		
	11.02 Propose solutions to given problems.		
	11.03 Design and implement the optimal solution to a given problem.		
	11.04 Document each step of the design/problem-solving process.		
	11.05 Demonstrate "brainstorming" as a process to solve problems.		
	11.06 Define "critical thinking" and its value in the problem-solving process.		
12.0	Express an understanding of technological systems and their complex interrelationships--The student will be able to:		
	12.01 Demonstrate knowledge of how social, organizational, and technological systems work.		
	12.02 Explore methods used to monitor and correct performance of technological systems.		
	12.03 Design and implement an optimal solution to a given problem.		
	12.04 Outline major historical technological developments or events.		
	12.05 Identify recent advances in technology.		
	12.06 Explain problem-solving roles of technology.		
	12.07 Forecast a technological development or event.		
	12.08 Define technology.		
13.0	Demonstrate the ability to properly identify, organize, plan, and allocate resources--The student will be able to:		
	13.01 Demonstrate the ability to select goal-relevant activities, rank them, allocate time, and prepare and follow schedules.		
	13.02 Use or prepare budgets, make forecasts, keep records, and make adjustments to meet objectives.		
	13.03 Demonstrate the ability to acquire, store, allocate, and use materials or space efficiently.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	13.04 Display knowledge of the efficient use of human resources.		
19.0	Demonstrate knowledge of the production systems found in modern industries--The student will be able to:		
	19.01 List and describe the three major types of production activities.		
	19.02 Describe resource processing systems.		
	19.03 Describe product manufacturing systems.		
	19.04 Describe structure construction systems.		
	19.05 Identify recent technological advances in production systems.		
20.0	Define the processes related to materials utilized in manufacturing and production--The student will be able to:		
	20.01 Define manufacturing.		
	20.02 List and describe six types of secondary manufacturing processes.		
	20.03 List ways in which computers are used in the manufacturing and production systems.		
21.0	Plan and develop a system to produce a product from available materials--The student will be able to:		
	21.01 Sketch, draw and interpret working drawings.		
	21.02 Use measuring tools and instruments.		
	21.03 Design and construct one or more individual projects utilizing technical skills and processes of woods, metals and plastics technology.		
	21.04 Estimate the cost of the job required to produce the project.		
	21.05 List groups or organizations that represent specialized manufacturing and production skills.		

Florida Department of Education
Student Performance Standards

Course Title: **Drafting/Illustrative Design Systems**
Course Number: **8600440**
Course Credit: **.5 Credit**
Teacher Certification: **TEC ED 1 @2** **ENG @7 7G**
GRAPH ARTS @4 **DRAFTING @7 7G**

NOTE: If the majority of the students enrolled in this course are 9th and/or 10th graders, the Florida Standards for Technical Subjects 01.0, 02.0, and 03.0 must be used in conjunction with the standards outlined in this course.

NOTE: If the majority of the students enrolled in this course are 11th and/or 12th graders, the Florida Standards for Technical Subjects 04.0, 05.0, and 06.0 must be used in conjunction with the standards outlined in this course.

Course Description:
The purpose of this course is to provide students with a foundation of knowledge and technically oriented experiences in the study of drafting/illustrative and design systems.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
07.0	Demonstrate the ability to work safely with a variety of technologies--The student will be able to:		
07.01	Select appropriate tools, procedures, and/or equipment needed to produce a product.		
07.02	Demonstrate the safe usage of appropriate tools, procedures, and operation of equipment needed to produce a product.		
07.03	Demonstrate knowledge required to maintain and troubleshoot.		
07.04	Follow laboratory safety rules and procedures.		
07.05	Demonstrate good housekeeping at work state and within total laboratory.		
07.06	Identify color-coding safety standards.		
07.07	Explain fire prevention and safety precautions and practices for extinguishing fires.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	07.08 Identify harmful effects/potential dangers of familiar hazardous substances/devices to people and the environment.		
08.0	Demonstrate interpersonal skills as they relate to the workplace--The student will be able to:		
	08.01 Perform roles in a student personnel system or in the Florida Technology Student Association (FL-TSA).		
	08.02 Participate as a member of a team.		
	08.03 Teach others new skills.		
	08.04 Identify skills needed to serve clients/customers.		
	08.05 Demonstrate leadership skills.		
	08.06 Describe strategies necessary for negotiating agreements.		
	08.07 Demonstrate the application of skills necessary to work with people of diverse backgrounds.		
	08.08 Form an understanding and appreciation for work after listening to or observing technology workers.		
	08.09 Form an understanding and appreciation for work after participating in a simulated technology group project in the laboratory.		
	08.10 Form an understanding and appreciation for the roles and work of co-workers.		
09.0	Identify and apply methods of information acquisition and utilizations--The student will be able to:		
	09.01 Define terms related to computers.		
	09.02 Identify and describe methods of information acquisition and evaluation.		
	09.03 Discuss advantages and disadvantages in the application of technologies.		
	09.04 Produce a plan to organize and maintain information relevant to emerging technologies.		
	09.05 Comprehend and communicate information relevant to emerging technologies.		
	09.06 Demonstrate the use of computers to process information.		
10.0	Apply basic skills in communications, mathematics, and science appropriate to technological content and learning activities--The student will be able to:		
	10.01 Identify and explain the main and subordinate ideas in a written work.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
10.02	Distinguish different purposes and methods of writing, identify a writer's point of view and tone, and interpret a writer's meaning.		
10.03	Define unfamiliar words by use of structural analysis, decoding, contextual clues, or by using a dictionary.		
10.04	Distinguish fact from opinion.		
10.05	Read critically by asking pertinent questions, by recognizing assumptions and implications, and by evaluating ideas.		
10.06	Select, relate, and organize, ideas using outlining and/or graphic organizers and develop the ideas in coherent paragraphs.		
10.07	Improve one's own writing by restructuring, correcting errors, and rewriting.		
10.08	Gather and organize information from primary and secondary sources; write a report using this research; quote, paraphrase, and summarize accurately; and cite sources properly.		
10.09	Vary one's writing style, including vocabulary and sentence structure, for different readers and purposes.		
10.10	Write logical and understandable statements, or phrases, to accurately fill out commonly used forms.		
10.11	Compose unified and coherent correspondence, directions, descriptions, explanations and reports.		
10.12	Participate critically and constructively in the exchange of ideas, particularly during class discussions and conferences with instructors.		
10.13	Conceive and develop ideas about a topic for the purpose of speaking to a group; choose and organize related ideas; present them clearly in Standard English; and evaluate similar presentations by others.		
10.14	Use the mathematics of: integers, fractions, and decimals; ratios, proportions, and percentages; roots and powers; algebra; and geometry.		
10.15	Make estimates and approximations, and judge the reasonableness of a result.		
10.16	Use elementary concepts of probability and statistics.		
10.17	Draw, read, and analyze graphs, charts, and tables.		
10.18	Ask appropriate scientific questions and recognize what is involved in experimental approaches to the solutions of such questions through familiarity with laboratory and fieldwork.		
10.19	Organize and communicate the results obtained by observation and experimentation.		
10.20	Apply the basic principles of biology, physics, and chemistry: (properties of matter; structure of compounds; concepts of motion; temperature, pressure and volume; work, power, force and energy; machines; human cell structure).		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
10.21	Identify problems rooted in basic biology, physics, or chemistry (effects of hazardous materials on health and safety, effects of drugs on health, troubleshooting problems on a machine).		
11.0	Demonstrate and apply design/problem-solving processes--The student will be able to:		
11.01	Describe and explain steps in the design/problem-solving process.		
11.02	Propose solutions to given problems.		
11.03	Design and implement the optimal solution to a given problem.		
11.04	Document each step of the design/problem-solving process.		
11.05	Demonstrate "brainstorming" as a process to solve problems.		
11.06	Define "critical thinking" and its value in the problem-solving process.		
12.0	Express an understanding of technological systems and their complex interrelationships--The student will be able to:		
12.01	Demonstrate knowledge of how social, organizational, and technological systems work.		
12.02	Explore methods used to monitor and correct performance of technological systems.		
12.03	Design and implement an optimal solution to a given problem.		
12.04	Outline major historical technological developments or events.		
12.05	Identify recent advances in technology.		
12.06	Explain problem-solving roles of technology.		
12.07	Forecast a technological development or event.		
12.08	Define technology.		
13.0	Demonstrate the ability to properly identify, organize, plan, and allocate resources--The student will be able to:		
13.01	Demonstrate the ability to select goal-relevant activities, rank them, allocate time, and prepare and follow schedules.		
13.02	Use or prepare budgets, make forecasts, keep records, and make adjustments to meet objectives.		
13.03	Demonstrate the ability to acquire, store, allocate, and use materials or space efficiently.		
13.04	Display knowledge of the efficient use of human resources.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
22.0	Demonstrate proper and safe procedures and technical knowledge and skills in the use and care of drafting instruments, materials and equipment--The student will be able to:		
22.01	Identify the basic tools and instruments for drafting.		
22.02	Interpret a blueprint, working drawing or other type of dimensional technical illustration.		
22.03	Produce a working drawing or technical illustration using drafting tools, instruments, and skills.		
23.0	Demonstrate technical knowledge, skills and applications common to all types of drafting including computer-aided drafting (CAD)--The student will be able to:		
23.01	Outline major technological developments in the history of drafting and design tools and equipment.		
23.02	Make freehand sketches.		
23.03	Produce a drawing using drafting instruments.		
23.04	Set up a computer to produce a drawing.		
24.0	Demonstrate technical knowledge and skills for making drafting sketches--The student will be able to:		
24.01	Illustrate a technical idea by means of a sketch.		
25.0	Demonstrate technical knowledge and skills for making orthographic drawings--The student will be able to:		
25.01	Explain the theory of orthographic projections.		
25.02	Identify the six principal views of an object.		
25.03	Produce a three-view orthographic drawing.		
26.0	Demonstrate technical knowledge and skills for making oblique pictorial drawings--The student will be able to:		
26.01	Define types of pictorial drawings.		
26.02	Produce an oblique pictorial drawing.		
27.0	Demonstrate technical knowledge and skills for making isometric pictorial drawings--The student will be able to:		
27.01	Discuss the isometric drawing procedures.		
27.02	Produce an isometric pictorial drawing.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
28.0	Demonstrate technical knowledge and skills for making aerodynamic drawings--The student will be able to:		
28.01	Discuss aerodynamic designs of aircraft and automobiles.		
28.02	Produce an aerodynamic scale drawing.		
29.0	Demonstrate technical knowledge and skills for making a computer-aided drawing (CAD)--The student will be able to:		
29.01	List the major components of a computer-aided drafting system and their functions.		
29.02	Demonstrate technical knowledge and skills in setting up a CAD system.		
30.0	Demonstrate technical knowledge and skills for reproducing a computer-aided drawing on a plotter--The student will be able to:		
30.01	Produce a computer-aided drawing, which can be displayed by means of a computer.		

Florida Department of Education
Student Performance Standards

Course Title: Electronics Systems
Course Number: 8600450
Course Credit: .5 Credit
Teacher Certification: ELECTRONIC @7 7G; TEC ED 1 @2; TEC ELEC @7; ENG @7 7G; ELECTRICAL @7 7G

NOTE: If the majority of the students enrolled in this course are 9th and/or 10th graders, the Florida Standards for Technical Subjects 01.0, 02.0, and 03.0 must be used in conjunction with the standards outlined in this course.

NOTE: If the majority of the students enrolled in this course are 11th and/or 12th graders, the Florida Standards for Technical Subjects 04.0, 05.0, and 06.0 must be used in conjunction with the standards outlined in this course.

Course Description:
The purpose of this course is to provide students with a foundation of knowledge and technically oriented experiences in the study of electronics systems.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
07.0	Demonstrate the ability to work safely with a variety of technologies--The student will be able to:		
07.01	Select appropriate tools, procedures, and/or equipment needed to produce a product.		
07.02	Demonstrate the safe usage of appropriate tools, procedures, and operation of equipment needed to produce a product.		
07.03	Demonstrate knowledge required to maintain and troubleshoot.		
07.04	Follow laboratory safety rules and procedures.		
07.05	Demonstrate good housekeeping at work state and within total laboratory.		
07.06	Identify color-coding safety standards.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	07.07 Explain fire prevention and safety precautions and practices for extinguishing fires.		
	07.08 Identify harmful effects/potential dangers of familiar hazardous substances/devices to people and the environment.		
08.0	Demonstrate interpersonal skills as they relate to the workplace--The student will be able to:		
	08.01 Perform roles in a student personnel system or in the Florida Technology Student Association (FL-TSA).		
	08.02 Participate as a member of a team.		
	08.03 Teach others new skills.		
	08.04 Identify skills needed to serve clients/customers.		
	08.05 Demonstrate leadership skills.		
	08.06 Describe strategies necessary for negotiating agreements.		
	08.07 Demonstrate the application of skills necessary to work with people of diverse backgrounds.		
	08.08 Form an understanding and appreciation for work after listening to or observing technology workers.		
	08.09 Form an understanding and appreciation for work after participating in a simulated technology group project in the laboratory.		
	08.10 Form an understanding and appreciation for the roles and work of co-workers.		
09.0	Identify and apply methods of information acquisition and utilizations--The student will be able to:		
	09.01 Define terms related to computers.		
	09.02 Identify and describe methods of information acquisition and evaluation.		
	09.03 Discuss advantages and disadvantages in the application of technologies.		
	09.04 Produce a plan to organize and maintain information relevant to emerging technologies.		
	09.05 Comprehend and communicate information relevant to emerging technologies.		
	09.06 Demonstrate the use of computers to process information.		
10.0	Apply basic skills in communications, mathematics, and science appropriate to technological content and learning activities--The student will be able to:		
	10.01 Identify and explain the main and subordinate ideas in a written work.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
10.02	Distinguish different purposes and methods of writing, identify a writer's point of view and tone, and interpret a writer's meaning.		
10.03	Define unfamiliar words by use of structural analysis, decoding, contextual clues, or by using a dictionary.		
10.04	Distinguish fact from opinion.		
10.05	Read critically by asking pertinent questions, by recognizing assumptions and implications, and by evaluating ideas.		
10.06	Select, relate, and organize, ideas using outlining and/or graphic organizers and develop the ideas in coherent paragraphs.		
10.07	Improve one's own writing by restructuring, correcting errors, and rewriting.		
10.08	Gather and organize information from primary and secondary sources; write a report using this research; quote, paraphrase, and summarize accurately; and cite sources properly.		
10.09	Vary one's writing style, including vocabulary and sentence structure, for different readers and purposes.		
10.10	Write logical and understandable statements, or phrases, to accurately fill out commonly used forms.		
10.11	Compose unified and coherent correspondence, directions, descriptions, explanations and reports.		
10.12	Participate critically and constructively in the exchange of ideas, particularly during class discussions and conferences with instructors.		
10.13	Conceive and develop ideas about a topic for the purpose of speaking to a group; choose and organize related ideas; present them clearly in Standard English; and evaluate similar presentations by others.		
10.14	Use the mathematics of: integers, fractions, and decimals; ratios, proportions, and percentages; roots and powers; algebra; and geometry.		
10.15	Make estimates and approximations, and judge the reasonableness of a result.		
10.16	Use elementary concepts of probability and statistics.		
10.17	Draw, read, and analyze graphs, charts, and tables.		
10.18	Ask appropriate scientific questions and recognize what is involved in experimental approaches to the solutions of such questions through familiarity with laboratory and fieldwork.		
10.19	Organize and communicate the results obtained by observation and experimentation.		
10.20	Apply the basic principles of biology, physics, and chemistry: (properties of matter; structure of compounds; concepts of motion; temperature, pressure and volume; work, power, force and energy; machines; human cell structure).		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
10.21	Identify problems rooted in basic biology, physics, or chemistry (effects of hazardous materials on health and safety, effects of drugs on health, troubleshooting problems on a machine).		
11.0	Demonstrate and apply design/problem-solving processes--The student will be able to:		
11.01	Describe and explain steps in the design/problem-solving process.		
11.02	Propose solutions to given problems.		
11.03	Design and implement the optimal solution to a given problem.		
11.04	Document each step of the design/problem-solving process.		
11.05	Demonstrate "brainstorming" as a process to solve problems.		
11.06	Define "critical thinking" and its value in the problem-solving process.		
12.0	Express an understanding of technological systems and their complex interrelationships--The student will be able to:		
12.01	Demonstrate knowledge of how social, organizational, and technological systems work.		
12.02	Explore methods used to monitor and correct performance of technological systems.		
12.03	Design and implement an optimal solution to a given problem.		
12.04	Outline major historical technological developments or events.		
12.05	Identify recent advances in technology.		
12.06	Explain problem-solving roles of technology.		
12.07	Forecast a technological development or event.		
12.08	Define technology.		
13.0	Demonstrate the ability to properly identify, organize, plan, and allocate resources--The student will be able to:		
13.01	Demonstrate the ability to select goal-relevant activities, rank them, allocate time, and prepare and follow schedules.		
13.02	Use or prepare budgets, make forecasts, keep records, and make adjustments to meet objectives.		
13.03	Demonstrate the ability to acquire, store, allocate, and use materials or space efficiently.		
13.04	Display knowledge of the efficient use of human resources.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
31.0	Apply electricity/electronics technology skills--The student will be able to:		
31.01	Identify and use the basic tools used in electricity/electronics.		
31.02	Identify and use the basic instruments used in electricity/electronics.		
31.03	Interpret electricity/electronics wiring diagrams and schematics.		
31.04	Identify electricity/electronics components.		
31.05	Explain the use of electricity/electronics components.		
31.06	Explain the difference between electricity and electronics.		
31.07	Describe and construct the following electricity circuits: switch controlled lamp holder, three-way switch, four-way switch, split wired receptacle, door buzzers, thermostat, timer, dimmer, photocell, and fluorescent lamp.		
32.0	Demonstrate technological literacy about electricity/electronics systems--The student will be able to:		
32.01	Outline major technological developments and events in the history of electricity/electronics.		
32.02	Identify recent advances in electricity/electronics.		
32.03	Explain the problem-solving roles of electricity/electronics.		
32.04	Forecast a development or event in electricity/electronics technology.		
32.05	Make a technical decision related to electricity/electronics.		
32.06	Define electricity/electronics technology.		
32.07	Define solid state, analog and digital systems.		
32.08	Explain the basic components of electrical/electronics systems.		
33.0	Demonstrate knowledge of the role electronics plays in magnetic, optical, fluid and mechanical control systems--The student will be able to:		
33.01	Identify examples of each type of control system.		
33.02	Explain the role electronics plays in systems feedback giving examples of everyday use.		
33.03	Identify by brainstorming new possible applications of control systems to satisfy a need or extend human capabilities.		

Florida Department of Education
Student Performance Standards

Course Title: **Engineering Systems**
Course Number: **8600460**
Course Credit: **.5 Credit**
Teacher Certification: **TEC ED 1 @2** **ENG TEC 7G**
ENG @7 7G

NOTE: If the majority of the students enrolled in this course are 9th and/or 10th graders, the Florida Standards for Technical Subjects 01.0, 02.0, and 03.0 must be used in conjunction with the standards outlined in this course.

NOTE: If the majority of the students enrolled in this course are 11th and/or 12th graders, the Florida Standards for Technical Subjects 04.0, 05.0, and 06.0 must be used in conjunction with the standards outlined in this course.

Course Description:
The purpose of this course is to provide students with a foundation of knowledge and technically oriented experiences in the study of engineering systems and its effect upon our lives and the choosing of an occupation.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
07.0	Demonstrate the ability to work safely with a variety of technologies--The student will be able to:		
07.01	Select appropriate tools, procedures, and/or equipment needed to produce a product.		
07.02	Demonstrate the safe usage of appropriate tools, procedures, and operation of equipment needed to produce a product.		
07.03	Demonstrate knowledge required to maintain and troubleshoot.		
07.04	Follow laboratory safety rules and procedures.		
07.05	Demonstrate good housekeeping at work state and within total laboratory.		
07.06	Identify color-coding safety standards.		
07.07	Explain fire prevention and safety precautions and practices for extinguishing fires.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	07.08 Identify harmful effects/potential dangers of familiar hazardous substances/devices to people and the environment.		
08.0	Demonstrate interpersonal skills as they relate to the workplace--The student will be able to:		
	08.01 Perform roles in a student personnel system or in the Florida Technology Student Association (FL-TSA).		
	08.02 Participate as a member of a team.		
	08.03 Teach others new skills.		
	08.04 Identify skills needed to serve clients/customers.		
	08.05 Demonstrate leadership skills.		
	08.06 Describe strategies necessary for negotiating agreements.		
	08.07 Demonstrate the application of skills necessary to work with people of diverse backgrounds.		
	08.08 Form an understanding and appreciation for work after listening to or observing technology workers.		
	08.09 Form an understanding and appreciation for work after participating in a simulated technology group project in the laboratory.		
	08.10 Form an understanding and appreciation for the roles and work of co-workers.		
09.0	Identify and apply methods of information acquisition and utilizations--The student will be able to:		
	09.01 Define terms related to computers.		
	09.02 Identify and describe methods of information acquisition and evaluation.		
	09.03 Discuss advantages and disadvantages in the application of technologies.		
	09.04 Produce a plan to organize and maintain information relevant to emerging technologies.		
	09.05 Comprehend and communicate information relevant to emerging technologies.		
	09.06 Demonstrate the use of computers to process information.		
10.0	Apply basic skills in communications, mathematics, and science appropriate to technological content and learning activities--The student will be able to:		
	10.01 Identify and explain the main and subordinate ideas in a written work.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
10.02	Distinguish different purposes and methods of writing, identify a writer's point of view and tone, and interpret a writer's meaning.		
10.03	Define unfamiliar words by use of structural analysis, decoding, contextual clues, or by using a dictionary.		
10.04	Distinguish fact from opinion.		
10.05	Read critically by asking pertinent questions, by recognizing assumptions and implications, and by evaluating ideas.		
10.06	Select, relate, and organize, ideas using outlining and/or graphic organizers and develop the ideas in coherent paragraphs.		
10.07	Improve one's own writing by restructuring, correcting errors, and rewriting.		
10.08	Gather and organize information from primary and secondary sources; write a report using this research; quote, paraphrase, and summarize accurately; and cite sources properly.		
10.09	Vary one's writing style, including vocabulary and sentence structure, for different readers and purposes.		
10.10	Write logical and understandable statements, or phrases, to accurately fill out commonly used forms.		
10.11	Compose unified and coherent correspondence, directions, descriptions, explanations and reports.		
10.12	Participate critically and constructively in the exchange of ideas, particularly during class discussions and conferences with instructors.		
10.13	Conceive and develop ideas about a topic for the purpose of speaking to a group; choose and organize related ideas; present them clearly in Standard English; and evaluate similar presentations by others.		
10.14	Use the mathematics of: integers, fractions, and decimals; ratios, proportions, and percentages; roots and powers; algebra; and geometry.		
10.15	Make estimates and approximations, and judge the reasonableness of a result.		
10.16	Use elementary concepts of probability and statistics.		
10.17	Draw, read, and analyze graphs, charts, and tables.		
10.18	Ask appropriate scientific questions and recognize what is involved in experimental approaches to the solutions of such questions through familiarity with laboratory and fieldwork.		
10.19	Organize and communicate the results obtained by observation and experimentation.		
10.20	Apply the basic principles of biology, physics, and chemistry: (properties of matter; structure of compounds; concepts of motion; temperature, pressure and volume; work, power, force and energy; machines; human cell structure).		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	10.21 Identify problems rooted in basic biology, physics, or chemistry (effects of hazardous materials on health and safety, effects of drugs on health, troubleshooting problems on a machine).		
11.0	Demonstrate and apply design/problem-solving processes--The student will be able to:		
	11.01 Describe and explain steps in the design/problem-solving process.		
	11.02 Propose solutions to given problems.		
	11.03 Design and implement the optimal solution to a given problem.		
	11.04 Document each step of the design/problem-solving process.		
	11.05 Demonstrate "brainstorming" as a process to solve problems.		
	11.06 Define "critical thinking" and its value in the problem-solving process.		
12.0	Express an understanding of technological systems and their complex interrelationships--The student will be able to:		
	12.01 Demonstrate knowledge of how social, organizational, and technological systems work.		
	12.02 Explore methods used to monitor and correct performance of technological systems.		
	12.03 Design and implement an optimal solution to a given problem.		
	12.04 Outline major historical technological developments or events.		
	12.05 Identify recent advances in technology.		
	12.06 Explain problem-solving roles of technology.		
	12.07 Forecast a technological development or event.		
	12.08 Define technology.		
13.0	Demonstrate the ability to properly identify, organize, plan, and allocate resources--The student will be able to:		
	13.01 Demonstrate the ability to select goal-relevant activities, rank them, allocate time, and prepare and follow schedules.		
	13.02 Use or prepare budgets, make forecasts, keep records, and make adjustments to meet objectives.		
	13.03 Demonstrate the ability to acquire, store, allocate, and use materials or space efficiently.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	13.04 Display knowledge of the efficient use of human resources.		
34.0	Demonstrate engineering analysis and design methods--The student will be to:		
	34.01 Define the terms: analysis, design, and applications.		
	34.02 Define the experimental method as it is applied to design.		
	34.03 Describe a design methodology.		
	34.04 Describe simulation.		
	34.05 Prepare a model of a design solution to an engineering problem.		
	34.06 Prepare a graphical solution to an engineering problem.		
	34.07 Prepare a mathematical solution to an engineering problem (using either a calculator or computer).		
35.0	Communicate through oral written, or graphic means, the results of solutions or designs--The student will be able to:		
	35.01 Understand and interpret basic engineering drawings.		
	35.02 Measure quantities and conduct basic tests according to published procedures.		
	35.03 Use precision measuring tools and instruments to layout, measure and inspect parts or articles.		
	35.04 Sketch objects using multi-view and pictorial principles.		
	35.05 Prepare drawings using basic technical drawing instruments for orthographic and isometric projections.		
	35.06 Use engineering design graphics and descriptive geometry in the solution of design problems.		
	35.07 Describe graphic communications principles.		
36.0	Demonstrate and apply mechanical, fluid, electrical and thermal system principles--The student will be able to:		
	36.01 Assemble, operate, and identify the parts of a system that demonstrates mechanical systems principles.		
	36.02 Assemble, operate, and identify the parts of a system that demonstrates fluid system principles.		
	36.03 Assemble, operate, and identify the parts of a system that demonstrates electrical system principles.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	36.04 Assemble, operate, and identify the parts of a system that demonstrates thermal system principles.		
37.0	Demonstrate knowledge of materials and processes--The student will be able to:		
	37.01 Describe the physical and chemical properties of engineering materials in terms of their structure.		
	37.02 List the causes of failure in materials and give procedures to prevent such failure.		
	37.03 Experiment with processes used with metal, woods, polymers, composite materials and adhesives.		
38.0	Use tools, machines, calculators, and computers necessary for obtaining solutions to design problems--The student will be able to:		
	38.01 Demonstrate the use of various graphs to categorize and display data.		
	38.02 Make decisions using graphical data presentations.		
	38.03 Demonstrate the use of a number graph in solving equations.		
	38.04 Use a numerical calculator to solve complex equations either by direct solution or iteration (trial and error).		
	38.05 Use a computer and applications software to solve a design problem by simulation.		
	38.06 Demonstrate graphical vector analysis.		
39.0	Describe the functional characteristics of the engineering design team--The student will be able to:		
	39.01 Describe work breakdown organization.		
	39.02 Describe the function of management in general and project management in particular.		
	39.03 Outline a research methodology.		
	39.04 Describe brainstorming.		

Florida Department of Education
Student Performance Standards

Course Title: **Applied Technology Systems**
Course Number: **8600470**
Course Credit: **.5 Credit**
Teacher Certification: **TEC ED 1 @2** **ENG TEC 7G**
ENG @7 7G

NOTE: If the majority of the students enrolled in this course are 9th and/or 10th graders, the Florida Standards for Technical Subjects 01.0, 02.0, and 03.0 must be used in conjunction with the standards outlined in this course.

NOTE: If the majority of the students enrolled in this course are 11th and/or 12th graders, the Florida Standards for Technical Subjects 04.0, 05.0, and 06.0 must be used in conjunction with the standards outlined in this course.

Course Description:
The purpose of this course is to provide students with a foundation of knowledge and technically oriented experiences in the study of applied technology systems and its effect upon our lives and the choosing of an occupation.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
07.0	Demonstrate the ability to work safely with a variety of technologies--The student will be able to:		
07.01	Select appropriate tools, procedures, and/or equipment needed to produce a product.		
07.02	Demonstrate the safe usage of appropriate tools, procedures, and operation of equipment needed to produce a product.		
07.03	Demonstrate knowledge required to maintain and troubleshoot.		
07.04	Follow laboratory safety rules and procedures.		
07.05	Demonstrate good housekeeping at work state and within total laboratory.		
07.06	Identify color-coding safety standards.		
07.07	Explain fire prevention and safety precautions and practices for extinguishing fires.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	07.08 Identify harmful effects/potential dangers of familiar hazardous substances/devices to people and the environment.		
08.0	Demonstrate interpersonal skills as they relate to the workplace--The student will be able to:		
	08.01 Perform roles in a student personnel system or in the Florida Technology Student Association (FL-TSA).		
	08.02 Participate as a member of a team.		
	08.03 Teach others new skills.		
	08.04 Identify skills needed to serve clients/customers.		
	08.05 Demonstrate leadership skills.		
	08.06 Describe strategies necessary for negotiating agreements.		
	08.07 Demonstrate the application of skills necessary to work with people of diverse backgrounds.		
	08.08 Form an understanding and appreciation for work after listening to or observing technology workers.		
	08.09 Form an understanding and appreciation for work after participating in a simulated technology group project in the laboratory.		
	08.10 Form an understanding and appreciation for the roles and work of co-workers.		
09.0	Identify and apply methods of information acquisition and utilizations--The student will be able to:		
	09.01 Define terms related to computers.		
	09.02 Identify and describe methods of information acquisition and evaluation.		
	09.03 Discuss advantages and disadvantages in the application of technologies.		
	09.04 Produce a plan to organize and maintain information relevant to emerging technologies.		
	09.05 Comprehend and communicate information relevant to emerging technologies.		
	09.06 Demonstrate the use of computers to process information.		
10.0	Apply basic skills in communications, mathematics, and science appropriate to technological content and learning activities--The student will be able to:		
	10.01 Identify and explain the main and subordinate ideas in a written work.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
10.02	Distinguish different purposes and methods of writing, identify a writer's point of view and tone, and interpret a writer's meaning.		
10.03	Define unfamiliar words by use of structural analysis, decoding, contextual clues, or by using a dictionary.		
10.04	Distinguish fact from opinion.		
10.05	Read critically by asking pertinent questions, by recognizing assumptions and implications, and by evaluating ideas.		
10.06	Select, relate, and organize, ideas using outlining and/or graphic organizers and develop the ideas in coherent paragraphs.		
10.07	Improve one's own writing by restructuring, correcting errors, and rewriting.		
10.08	Gather and organize information from primary and secondary sources; write a report using this research; quote, paraphrase, and summarize accurately; and cite sources properly.		
10.09	Vary one's writing style, including vocabulary and sentence structure, for different readers and purposes.		
10.10	Write logical and understandable statements, or phrases, to accurately fill out commonly used forms.		
10.11	Compose unified and coherent correspondence, directions, descriptions, explanations and reports.		
10.12	Participate critically and constructively in the exchange of ideas, particularly during class discussions and conferences with instructors.		
10.13	Conceive and develop ideas about a topic for the purpose of speaking to a group; choose and organize related ideas; present them clearly in Standard English; and evaluate similar presentations by others.		
10.14	Use the mathematics of: integers, fractions, and decimals; ratios, proportions, and percentages; roots and powers; algebra; and geometry.		
10.15	Make estimates and approximations, and judge the reasonableness of a result.		
10.16	Use elementary concepts of probability and statistics.		
10.17	Draw, read, and analyze graphs, charts, and tables.		
10.18	Ask appropriate scientific questions and recognize what is involved in experimental approaches to the solutions of such questions through familiarity with laboratory and fieldwork.		
10.19	Organize and communicate the results obtained by observation and experimentation.		
10.20	Apply the basic principles of biology, physics, and chemistry: (properties of matter; structure of compounds; concepts of motion; temperature, pressure and volume; work, power, force and energy; machines; human cell structure).		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	10.21 Identify problems rooted in basic biology, physics, or chemistry (effects of hazardous materials on health and safety, effects of drugs on health, troubleshooting problems on a machine).		
11.0	Demonstrate and apply design/problem-solving processes--The student will be able to:		
	11.01 Describe and explain steps in the design/problem-solving process.		
	11.02 Propose solutions to given problems.		
	11.03 Design and implement the optimal solution to a given problem.		
	11.04 Document each step of the design/problem-solving process.		
	11.05 Demonstrate "brainstorming" as a process to solve problems.		
	11.06 Define "critical thinking" and its value in the problem-solving process.		
12.0	Express an understanding of technological systems and their complex interrelationships--The student will be able to:		
	12.01 Demonstrate knowledge of how social, organizational, and technological systems work.		
	12.02 Explore methods used to monitor and correct performance of technological systems.		
	12.03 Design and implement an optimal solution to a given problem.		
	12.04 Outline major historical technological developments or events.		
	12.05 Identify recent advances in technology.		
	12.06 Explain problem-solving roles of technology.		
	12.07 Forecast a technological development or event.		
	12.08 Define technology.		
13.0	Demonstrate the ability to properly identify, organize, plan, and allocate resources--The student will be able to:		
	13.01 Demonstrate the ability to select goal-relevant activities, rank them, allocate time, and prepare and follow schedules.		
	13.02 Use or prepare budgets, make forecasts, keep records, and make adjustments to meet objectives.		
	13.03 Demonstrate the ability to acquire, store, allocate, and use materials or space efficiently.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	13.04 Display knowledge of the efficient use of human resources.		
40.0	Discuss the impact of technology on society and the environment--The student will be able to:		
	40.01 Discuss the impact of technology, now and in the future.		
	40.02 Discuss the impacts of technology on work, job opportunities and careers.		
	40.03 Identify the scope of technological impacts.		
	40.04 Identify means of controlling the world impacts of technology.		
	40.05 Discuss expected and unexpected impacts of technology.		
	40.06 Discuss desired and undesired impacts of technology.		
	40.07 Prepare a report on the impact of technology.		
41.0	Demonstrate and apply mechanical system principles--The student will be able to:		
	41.01 Assemble, operate, and identify the parts of a system that demonstrates mechanical system principles.		
	41.02 Demonstrate and apply principles of force, work, rate, resistance, energy, power, and force transformers relating to mechanical systems.		
42.0	Demonstrate and apply fluid system principles--The student will be able to:		
	42.01 Assemble, operate and identify the parts of a system that demonstrates fluid system principles.		
	42.02 Demonstrate and apply principle of force, work, rate, resistance, energy, power, and force transformers, relating to fluid systems.		
43.0	Demonstrate and apply electrical system principles--The student will be able to:		
	43.01 Assemble, operate, and identify the parts of a system that demonstrates electrical system principles.		
	43.02 Demonstrate and apply principles of force, work, rate, resistance, energy, power, and force transformers relating to electrical systems.		
44.0	Demonstrate and apply thermal system principles--The student will be able to:		
	44.01 Assemble, operate, and identify the parts of a system that demonstrates thermal system principles.		
	44.02 Demonstrate and apply principles of force, work, rate, resistance, energy, power, and force transformers relating to thermal systems.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
45.0	Demonstrate the use of a computer to integrate and control a system composed of mechanical, fluid and electrical systems--The student will be able to:		
45.01	Diagram an integrated system incorporating input, monitoring, controlling, output and feedback components.		
45.02	Perform experiments using mechanical, fluid and electrical components in an integrated system.		
45.03	Assemble, operate and identify the parts of computer-controlled mechanical, fluid, and electrical systems.		
46.0	Demonstrate the use of sensors to control systems--The student will be able to:		
46.01	Perform experiments using electronic sensors.		
46.02	Assemble, operate and identify the types of sensors used in technology.		
46.03	Write a report on the applications of sensors used in technology.		
47.0	Demonstrate the use of fiber optics concepts--The student will be able to:		
47.01	Write a report on the application of fiber optics used in technology.		
47.02	Perform fiber optics experiments.		
47.03	Assemble, operate and identify the parts of a fiber optics system.		
48.0	Demonstrate the use of laser optics concepts--The student will be able to:		
48.01	Write a report on the applications of laser optics used in technology.		
48.02	Perform laser optics experiments.		
48.03	Assemble, operate and identify the parts of a laser optics system.		

Florida Department of Education
Student Performance Standards

Course Title: Home Technology Systems
Course Number: 8600480
Course Credit: .5 Credit
Teacher Certification: TEC ED 1 @2 ENG TEC 7G
ENG @7 7G

NOTE: If the majority of the students enrolled in this course are 9th and/or 10th graders, the Florida Standards for Technical Subjects 01.0, 02.0, and 03.0 must be used in conjunction with the standards outlined in this course.

NOTE: If the majority of the students enrolled in this course are 11th and/or 12th graders, the Florida Standards for Technical Subjects 04.0, 05.0, and 06.0 must be used in conjunction with the standards outlined in this course.

Course Description:
The purpose of this course is to provide students with a foundation of knowledge and technically oriented experiences in the study of home technology systems and its effect upon our lives and the choosing of an occupation.

Abbreviations:
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NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
07.0	Demonstrate the ability to work safely with a variety of technologies--The student will be able to:		
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07.03	Demonstrate knowledge required to maintain and troubleshoot.		
07.04	Follow laboratory safety rules and procedures.		
07.05	Demonstrate good housekeeping at work state and within total laboratory.		
07.06	Identify color-coding safety standards.		
07.07	Explain fire prevention and safety precautions and practices for extinguishing fires.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	07.08 Identify harmful effects/potential dangers of familiar hazardous substances/devices to people and the environment.		
08.0	Demonstrate interpersonal skills as they relate to the workplace--The student will be able to:		
	08.01 Perform roles in a student personnel system or in the Florida Technology Student Association (FL-TSA).		
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	09.05 Comprehend and communicate information relevant to emerging technologies.		
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10.12	Participate critically and constructively in the exchange of ideas, particularly during class discussions and conferences with instructors.		
10.13	Conceive and develop ideas about a topic for the purpose of speaking to a group; choose and organize related ideas; present them clearly in Standard English; and evaluate similar presentations by others.		
10.14	Use the mathematics of: integers, fractions, and decimals; ratios, proportions, and percentages; roots and powers; algebra; and geometry.		
10.15	Make estimates and approximations, and judge the reasonableness of a result.		
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10.20	Apply the basic principles of biology, physics, and chemistry: (properties of matter; structure of compounds; concepts of motion; temperature, pressure and volume; work, power, force and energy; machines; human cell structure).		

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12.0	Express an understanding of technological systems and their complex interrelationships--The student will be able to:		
	12.01 Demonstrate knowledge of how social, organizational, and technological systems work.		
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	12.05 Identify recent advances in technology.		
	12.06 Explain problem-solving roles of technology.		
	12.07 Forecast a technological development or event.		
	12.08 Define technology.		
13.0	Demonstrate the ability to properly identify, organize, plan, and allocate resources--The student will be able to:		
	13.01 Demonstrate the ability to select goal-relevant activities, rank them, allocate time, and prepare and follow schedules.		
	13.02 Use or prepare budgets, make forecasts, keep records, and make adjustments to meet objectives.		
	13.03 Demonstrate the ability to acquire, store, allocate, and use materials or space efficiently.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	13.04 Display knowledge of the efficient use of human resources.		
49.0	Identify and list the different systems found in new homes under construction today--The student will be able to:		
	49.01 Identify systems used and install in home construction.		
	49.02 Develop a schedule of routine home system preventative maintenance.		
	49.03 Identify recent advances in home maintenance technology.		
50.0	Draw up a bill of materials required to repair a selected component in a home technology system--The student will be able to:		
	50.01 Identify a system component requiring repair.		
	50.02 Identify the problem and parts required to make repairs.		
	50.03 Estimate the cost of repair.		
51.0	Apply home maintenance technology skills to a selected system requiring repair--The student will be able to:		
	51.01 Identify and assemble the tools required to perform the repair.		
	51.02 Demonstrate knowledge of problem-solving approaches to handle home maintenance needs.		
	51.03 Demonstrate consumer technical knowledge about home maintenance tools, materials and equipment.		
	51.04 List ways in which a personal computer may be used for home maintenance purposes.		

Additional Information

Special Note:

NOTE: If the majority of the students enrolled in a course are 9th and/or 10th graders, the Florida Standards for Technical Subjects 01.0, 02.0, and 03.0 must be used in conjunction with the standards outlined in that course.

NOTE: If the majority of the students enrolled in a course are 11th and/or 12th graders, the Florida Standards for Technical Subjects 04.0, 05.0, and 06.0 must be used in conjunction with the standards outlined in that course.

Laboratory Activities

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

Career and Technical Student Organization (CTSO)

The Florida Technology Student Association (FL-TSA) is the intercurricular career and technical student organization for providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

Cooperative Training – OJT

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

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 Occupational Completion Point (OCP) or a Modified Occupational Completion Point (MOCP). If needed, a student may enroll in the same career and technical course more than once. Documentation should be included in the IEP that clearly indicates that it is anticipated that the student may need an additional year to complete an OCP/MOCP. The student should work on different competencies and new applications of competencies each year toward completion of the OCP/MOCP. After achieving the competencies identified for the year, the student earns credit for the course. It is important to ensure that credits earned by students are reported accurately. The district's information system must be designed to accept multiple credits for the same course number for eligible students with disabilities.

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

Florida Department of Education
Curriculum Framework

Program Title: **Drafting/Illustrative Design Technology**
Program Type: **Non Career Preparatory**
Career Cluster: **Engineering & Technology Education**

NOTE: This program has been **daggered for deletion** with 2014-2015 being the last cohort of students permitted to enroll in the program. After 2014-2015, **no new students may be enrolled in this program**. Students already enrolled in the program may continue taking courses in the program until completion. Courses will remain in the Course Code Directory for teach-out purposes. Alternative enrollment options for students include Architectural Drafting Secondary (8101100), Drafting (8725000), Structural Drafting Secondary (8101200), and Technical Design (8401000).

Secondary – Non Career Preparatory	
Program Number	8600800
CIP Number	0821010300
Grade Level	9-12; 30, 31
Standard Length	3 credits
Teacher Certification	TEC ED 1 @2 ENG @7 7G DRAFTING @7 7G GRAPH ARTS @4
CTSO	Florida Technology Student Association (FL-TSA)
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 drafting and design technology. 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, a study of the purposes, instruments, processes, and technical skills of drafting technology. The content and activities will also include the study of entrepreneurship, safety, and leadership skills.

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

Program Structure

This program is a planned sequence of instruction consisting of three one-credit courses. The following table illustrates the program structure:

Course Number	Course Title	Length	Level	Graduation Requirement
8600810	Drafting/Illustrative Design Technology I	1 credit	2	PA
8600820	Drafting/Illustrative Design Technology II	1 credit	2	PA
8600830	Drafting/Illustrative Design Technology III	1 credit	3	PA

(Graduation Requirement Abbreviations- EQ= Equally Rigorous Science, PA= Practical Arts, EC= Economics, VO= Career and Technical Education)

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.

Academic Alignment Table

Academic alignment is an ongoing, collaborative effort of professional educators specializing in the fields of science, mathematics, English/language arts, and Career and Technical Education (CTE). This initiative supports CTE programs by improving student performance through the integration of academic content within CTE courses. Career and Technical Education courses that have been aligned to the Next Generation Sunshine State Standards for Science and the Florida Standards for Mathematics and English/Language Arts will show the following data: the quantity of academic standards in the CTE course; the total number of standards contained in the academic course; and the percentage of alignment to the CTE course.

Courses	Anatomy/ Physiology Honors	Astronomy Solar/Galactic Honors	Biology 1	Chemistry 1	Earth-Space Science	Environmental Science	Genetics	Integrated Science	Marine Science 1 Honors	Physical Science	Physics 1
8600810	**	**	**	**	**	**	**	**	**	**	**
8600820	**	**	**	**	**	**	**	**	**	**	**
8600830	**	**	**	**	**	**	**	**	**	**	**

** *Alignment pending review* # *Alignment attempted, but no correlation to academic course*

Courses	Algebra 1	Algebra 2	Geometry	English 1	English 2	English 3	English 4
8600810	**	**	**	**	**	**	**
8600820	**	**	**	**	**	**	**
8600830	**	**	**	**	**	**	**

** *Alignment pending review* # *Alignment attempted, but no correlation to academic course*

Florida Standards for Technical Subjects

Florida Standards (FS) for English Language Arts and Literacy in History/Social Studies, Science, and Technical Subjects are the critical reading and writing literacy standards designed for grade 6 and above. These standards are predicated on teachers of history/social studies, science, and technical subjects using their content area expertise to help students meet the particular challenges of reading, writing, speaking, listening, and language in their respective fields. It is important to note that the 6-12 literacy standards in history/social studies, science, and technical subjects are not meant to replace content standards in those areas but rather to supplement them.

This curriculum framework incorporates the grades 9-10 reading and writing literacy standards in the first two courses of this CTE program and grade 11-12 reading and writing literacy standards in the third and fourth courses of this CTE program. The standards for Mathematical Practices describe varieties of expertise that educators at all levels should seek to develop in their students. These practices rest on important "processes and proficiencies" with longstanding importance in mathematics education. This curriculum framework incorporates the appropriate mathematical practices in the first four courses of this CTE program.

Common Career Technical Core – Career Ready Practices

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

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

2. Apply appropriate academic and technical skills.

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

4. Communicate clearly, effectively and with reason.

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

6. Demonstrate creativity and innovation.

7. Employ valid and reliable research strategies.

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

9. Model integrity, ethical leadership and effective management.

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

11. Use technology to enhance productivity.

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

Standards

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

01.0 Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Drafting/Illustrative Design Technology.
02.0 Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Drafting/Illustrative Design Technology.
03.0 Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Drafting/Illustrative Design Technology.
04.0 Demonstrate an understanding of the characteristics and scope of technology.
05.0 Demonstrate an understanding of the core concepts of technology
06.0 Demonstrate an understanding of the relationships among technologies and the connections between technology and other fields of study.
07.0 Demonstrate an understanding of the cultural, social, economic, and political effects of technology.
08.0 Demonstrate an understanding of the influence of technology on history.
09.0 Demonstrate an understanding of the attributes of design.
10.0 Demonstrate an understanding of engineering design.
11.0 Demonstrate an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving.
12.0 Demonstrate abilities to apply the design process.
13.0 Demonstrate the abilities to use and maintain technological products and systems.
14.0 Demonstrate the abilities to assess the impact of products and systems.
15.0 Demonstrate an understanding of and be able to select and use information and communication technologies.
16.0 Demonstrate an understanding of and be able to select and use manufacturing technologies.
17.0 Demonstrate an understanding of and be able to select and use construction technologies.
18.0 Demonstrate technical knowledge and skills about the use and care of drafting instruments, equipment, and materials.
19.0 Demonstrate technical skills and applications common to all types of drafting.
20.0 Demonstrate technical knowledge and skills for making basic orthographic drawings.
21.0 Demonstrate technical knowledge and skills for making pictorial drawings.
22.0 Demonstrate technical knowledge and skills for making auxiliary view drawings.
23.0 Demonstrate technical knowledge and skills for making sectional view drawings.
24.0 Demonstrate technical knowledge and skills for making working drawings.
25.0 Demonstrate technical knowledge and skills for making a basic residential drawing.
26.0 Demonstrate technical knowledge and skills for making architectural drawings to industry standards.
27.0 Demonstrate technical knowledge and skills for making a reverse engineered drawing (as built) from a solid object.
28.0 Demonstrate technical knowledge and skills for making technical illustrations.
29.0 Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Drafting/Illustrative Design Technology.
30.0 Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Drafting/Illustrative Design Technology.
31.0 Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Drafting/Illustrative Design Technology.

32.0 Demonstrate technical knowledge and skills for making engineering drawings.
33.0 Demonstrate and present a research and design project.
34.0 Demonstrate an understanding of career opportunities and requirements in the field of drafting/illustrative design technology.

Florida Department of Education
Student Performance Standards

Course Title: **Drafting/Illustrative Design Technology I**
Course Number: **8600810**
Course Credit: **1**

Course Description:
This course provides students with an introduction to the knowledge, human relations, and technical skills of drafting technology.

Florida Standards			Correlation to CTE Program Standard #
01.0	Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Drafting/Illustrative Design Technology.		
	01.01 Key Ideas and Details		
	01.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. LAFS.910.RST.1.1	
	01.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.910.RST.1.2	
	01.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.910.RST.1.3	
	01.02 Craft and Structure		
	01.02.1	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. LAFS.910.RST.2.4	
	01.02.2	Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). LAFS.910.RST.2.5	
	01.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. LAFS.910.RST.2.6	

Florida Standards			Correlation to CTE Program Standard #
01.03	Integration of Knowledge and Ideas		
	01.03.1	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. LAFS.910.RST.3.7	
	01.03.2	Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. LAFS.910.RST.3.8	
	01.03.3	Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. LAFS.910.RST.3.9	
01.04	Range of Reading and Level of Text Complexity		
	01.04.1	By the end of grade 9, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	01.04.2	By the end of grade 10, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 9–10 text complexity band independently and proficiently. LAFS.910.RST.4.10	
02.0	Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Drafting/Illustrative Design Technology.		
02.01	Text Types and Purposes		
	02.01.1	Write arguments focused on discipline-specific content. LAFS.910.WHST.1.1	
	02.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.910.WHST.1.2	
02.02	Production and Distribution of Writing		
	02.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.910.WHST.2.4	
	02.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.910.WHST.2.5	

Florida Standards			Correlation to CTE Program Standard #
	02.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. LAFS.910.WHST.2.6	
02.03	Research to Build and Present Knowledge		
	02.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.910.WHST.3.7	
	02.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. LAFS.910.WHST.3.8	
	02.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.910.WHST.3.9	
02.04	Range of Writing		
	02.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.910.WHST.4.10	
03.0	Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Drafting/Illustrative Design Technology.		
03.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1		
03.02	Reason abstractly and quantitatively. MAFS.K12.MP.2.1		
03.03	Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1		
03.04	Model with mathematics. MAFS.K12.MP.4.1		
03.05	Use appropriate tools strategically. MAFS.K12.MP.5.1		

Florida Standards	Correlation to CTE Program Standard #
03.06 Attend to precision. MAFS.K12.MP.6.1	
03.07 Look for and make use of structure. MAFS.K12.MP.7.1	
03.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
04.0	Demonstrate an understanding of the characteristics and scope of technology. – The student will be able to:		
04.01	Discuss the nature and development of technological knowledge and processes.		
04.02	Conduct specific goal-directed research related to inventions and innovations.		
05.0	Demonstrate an understanding of the core concepts of technology. – The student will be able to:		
05.01	Identify systems thinking logic and creativity with appropriate compromises in complex real-life problems.		
05.02	Define technological systems, which are the building blocks of technology and are embedded within larger technological, social, and environmental systems.		
05.03	Identify resources involving trade-offs between competing values, such as availability, cost, desirability, and waste.		
05.04	Identify the criteria and constraints of a product or system and then determine how they affect the final design and development.		
05.05	Define a management system as the process of planning, organizing, and controlling work.		
06.0	Demonstrate an understanding of the relationships among technologies and the connection between technology and other fields of study. – The student will be able to:		
06.01	Identify technology transfer occurring when a new user applies an existing innovation developed for one purpose in a different function.		
06.02	Identify technological innovation resulting when ideas, knowledge, or skills are shared within a technology, among technologies, or across other fields.		
06.03	Identify technological progresses that promote the advancement of science and mathematics.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
07.0	Demonstrate an understanding of the cultural, social, economic, and political effects of technology. – The student will be able to:		
07.01	Identify changes caused by the use of technology ranging from gradual to rapid and from subtle to obvious.		
07.02	Classify the use of technology involving weighing the trade-offs between the positive and the negative effects.		
07.03	List the cultural, social, economic, and political changes caused by the transfer of a technology from one society to another.		
08.0	Demonstrate an understanding of the influence of technology on history. – The student will be able to:		
08.01	Research how the evolution of civilization has been directly affected by, and has in turn affected the development and use of tools and materials.		
08.02	Define the history of technology as a powerful force in reshaping the social, cultural, political, and economic landscape.		
08.03	Define the Industrial Revolution and the development of continuous manufacturing, sophisticated transportation and communication systems, advanced construction practices, and improved education and leisure time.		
08.04	Define the Information Age and its placement of emphasis on the processing and exchange of information.		
09.0	Demonstrate an understanding of the attributes of design. – The student will be able to:		
09.01	Recognize the design process; including defining a problem, brainstorming, researching and generating ideas, identifying criteria and specifying constraints, exploring possibilities, selecting an approach, developing a design proposal, making a model or prototype, testing and evaluating the design using specifications, refining the design, creating or making it, and communicating processes and results.		
09.02	Restate design problems that are seldom presented in a clearly defined form.		
09.03	Check and critique a design continually, and improve and revise the idea of the design as needed.		
09.04	List competing requirements of a design, such as criteria, constraints, and efficiency.		
10.0	Demonstrate an understanding of engineering design. – The student will be able to:		
10.01	Identify design principles used to evaluate existing designs, to collect data, and to guide the design process.		
10.02	Describe the influence of personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly on the engineering design process.		
10.03	Construct a prototype or working model used to test a design concept by making actual observations and necessary adjustments.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	10.04 Identify factors taken into account in the process of engineering design.		
11.0	Demonstrate an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving. – The student will be able to:		
	11.01 Define research and development as a specific problem solving approach that is used intensively in business and industry to prepare devices and systems for the marketplace.		
	11.02 Identify research needed to solve technological problems.		
	11.03 Differentiate between technological and non-technological problems, and identify which problems can be solved using technology.		
	11.04 Utilize a multidisciplinary approach to solving technological problems.		
12.0	Demonstrate the abilities to apply the design process. – The student will be able to:		
	12.01 Identify the design problem to solve and decide whether or not to address it.		
	12.02 List criteria and constraints and determine how these will affect the design process.		
	12.03 Refine a design by using prototypes and modeling to ensure quality, efficiency, and productivity of the final product.		
	12.04 Evaluate the design solution using conceptual, physical, and mathematical models at various intervals of the design process in order to check for proper design and to note areas where improvements are needed.		
	12.05 Develop a product or system using a design process.		
	12.06 Evaluate final solutions and communicate observations, processes, and results of the entire design process, using verbal, graphic, quantitative, virtual, and written means, in addition to three-dimensional models.		
13.0	Demonstrate the abilities to use and maintain technological products and systems. – The student will be able to:		
	13.01 Document processes and procedures and communicate them to different audiences using appropriate oral and written techniques.		
	13.02 Diagnose a system that is malfunctioning and use tools, materials, machines, and knowledge to repair it.		
	13.03 Troubleshoot, analyze, and maintain systems to ensure safe and proper function and precision.		
	13.04 Operate systems so that they function in the way they were designed.		
	13.05 Use computers and calculators to access, retrieve, organize, process, maintain, interpret, and evaluate data and information in order to communicate.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
14.0	Demonstrate the abilities to assess the impact of products and systems. – The student will be able to:		
14.01	Collect information and evaluate its quality.		
14.02	Synthesize data, analyze trends, and draw conclusions regarding the effect of technology on the individual, society, and the environment.		
14.03	Use assessment techniques, such as trend analysis and experimentation to make decisions about the future development of technology.		
14.04	Design forecasting techniques to evaluate the results of altering natural systems.		
15.0	Demonstrate an understanding of and be able to select and use information and communication technologies. – The student will be able to:		
15.01	Discuss information and communication technologies including the inputs, processes, and outputs associated with sending and receiving information.		
15.02	Classify information and communication systems that allow information to be transferred as human to human, human to machine, machine to human, or machine to machine.		
15.03	Use information and communication systems to inform, persuade, entertain, control, manage, and educate.		
15.04	Identify many ways to communicate information, such as graphic and electronic means.		
15.05	Communicate technological knowledge and processes using symbols, measurement, conventions, icons, graphic images, and languages that incorporate a variety of visual, auditory, and tactile stimuli.		
16.0	Demonstrate an understanding of and be able to select and use manufacturing technologies. – The student will be able to:		
16.01	Service products to keep them in good operating condition.		
16.02	Discuss the interchangeability of parts to increase the effectiveness of manufacturing processes.		
18.0	Demonstrate technical knowledge and skills about the use and care of drafting instruments, equipment, and materials. – The student will be able to:		
18.01	Identify and demonstrate technical knowledge and skills about the use and care of drafting instruments and equipment.		
18.02	Demonstrate technical knowledge and skills about the properties, specifications, and use of drafting materials and supplies.		
19.0	Demonstrate technical skills and applications common to all types of drafting. – The student will be able to:		
19.01	Apply lettering techniques.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
19.02	Make freehand sketches.		
19.03	Use drafting symbols and alphabet of lines in accordance with technical standards and practices.		
19.04	Apply measuring techniques.		
19.05	Apply industry standard dimensioning techniques.		
19.06	Apply geometric construction techniques.		
19.07	Interpret information from drawings, prints, and sketches.		
19.08	Apply coordinate systems.		
19.09	Produce and reproduce drawings using modern technical methods for drafting reproduction.		
20.0	Demonstrate technical knowledge and skills for making basic orthographic drawings. – The student will be able to:		
20.01	Explain the theory of orthographic projection.		
20.02	Identify the six principal views of an object.		
20.03	Produce a three-view orthographic drawing.		
20.04	Produce a CAD three-view orthographic drawing.		
21.0	Demonstrate technical knowledge and skills for making pictorial drawings. – The student will be able to:		
21.01	Explain methods of pictorial drawing.		
21.02	Produce an isometric drawing.		
21.03	Produce a CAD isometric drawing.		
21.04	Produce an oblique drawing.		
21.05	Produce a CAD oblique drawing.		
21.06	Produce a perspective drawing.		
21.07	Produce a CAD perspective drawing.		
22.0	Demonstrate technical knowledge and skills for making auxiliary view drawings. – The student will be able to:		
22.01	Explain terminology and concepts associated with auxiliary view drawings.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	22.02 Produce an auxiliary view drawing.		
	22.03 Produce a CAD auxiliary view drawing.		
	22.04 Develop a pattern using surface development techniques.		
23.0	Demonstrate technical knowledge and skills for making sectional view drawings. – The student will be able to:		
	23.01 Define sectional view and types of sectional views.		
	23.02 Illustrate the types of breaks and symbols used in drawing sectional views.		
	23.03 Produce a sectional view drawing.		
	23.04 Produce a CAD sectional view drawing.		
24.0	Demonstrate technical knowledge and skills for making working drawings. – The student will be able to:		
	24.01 Produce detailed machine drawings.		
	24.02 Produce detailed assembly drawings.		
	24.03 Produce a technical illustration.		
25.0	Demonstrate technical knowledge and skills for making a basic residential drawing. – The student will be able to:		
	25.01 Produce a dimensioned floor plan.		
	25.02 Produce dimensioned elevation drawings.		

Florida Department of Education
Student Performance Standards

Course Title: **Drafting/Illustrative Design Technology II**
Course Number: **8600820**
Course Credit: **1**

Course Description:
This course provides students with an intermediate understanding of the knowledge, human relations, and technical skills of drafting and design technology.

Florida Standards			Correlation to CTE Program Standard #
01.0	Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Drafting/Illustrative Design Technology.		
	01.01 Key Ideas and Details		
	01.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. LAFS.910.RST.1.1	
	01.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.910.RST.1.2	
	01.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.910.RST.1.3	
	01.02 Craft and Structure		
	01.02.1	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. LAFS.910.RST.2.4	
	01.02.2	Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). LAFS.910.RST.2.5	
	01.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. LAFS.910.RST.2.6	

Florida Standards			Correlation to CTE Program Standard #
01.03	Integration of Knowledge and Ideas		
	01.03.1	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. LAFS.910.RST.3.7	
	01.03.2	Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. LAFS.910.RST.3.8	
	01.03.3	Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. LAFS.910.RST.3.9	
01.04	Range of Reading and Level of Text Complexity		
	01.04.1	By the end of grade 9, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	01.04.2	By the end of grade 10, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 9–10 text complexity band independently and proficiently. LAFS.910.RST.4.10	
02.0	Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Drafting/Illustrative Design Technology.		
02.01	Text Types and Purposes		
	02.01.1	Write arguments focused on discipline-specific content. LAFS.910.WHST.1.1	
	02.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.910.WHST.1.2	
02.02	Production and Distribution of Writing		
	02.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.910.WHST.2.4	
	02.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.910.WHST.2.5	

Florida Standards			Correlation to CTE Program Standard #
	02.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. LAFS.910.WHST.2.6	
02.03	Research to Build and Present Knowledge		
	02.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.910.WHST.3.7	
	02.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. LAFS.910.WHST.3.8	
	02.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.910.WHST.3.9	
02.04	Range of Writing		
	02.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.910.WHST.4.10	
03.0	Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Drafting/Illustrative Design Technology.		
03.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1		
03.02	Reason abstractly and quantitatively. MAFS.K12.MP.2.1		
03.03	Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1		
03.04	Model with mathematics. MAFS.K12.MP.4.1		
03.05	Use appropriate tools strategically. MAFS.K12.MP.5.1		

Florida Standards	Correlation to CTE Program Standard #
03.06 Attend to precision. MAFS.K12.MP.6.1	
03.07 Look for and make use of structure. MAFS.K12.MP.7.1	
03.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
04.0	Demonstrate an understanding of the characteristics and scope of technology. – The student will be able to:		
04.01	Illustrate the nature and development of technological knowledge and processes.		
04.02	Explain the rapid increase in the rate of technological development and diffusion		
04.03	Conduct specific goal-directed research related to inventions and innovations.		
05.0	Demonstrate an understanding of the core concepts of technology. – The student will be able to:		
05.01	Apply systems thinking logic and creativity with appropriate compromises in complex real-life problems.		
05.02	Discuss technological systems, which are the building blocks of technology and are embedded within larger technological, social, and environmental systems.		
05.03	Select resources involving trade-offs between competing values, such as availability, cost, desirability, and waste.		
05.04	Identify the criteria and constraints of a product or system and then determine how they affect the final design and development.		
05.05	Utilize optimization as an ongoing process or methodology of designing or making a product dependent on criteria and constraints.		
05.06	Identify new technologies that create new processes.		
05.07	Implement a quality control process to ensure that a product, service or system meets established criteria.		
05.08	Organize a management system as the process of planning, organizing, and controlling work.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
06.0	Demonstrate an understanding of the relationships among technologies and the connection between technology and other fields of study. . – The student will be able to:		
06.01	Discuss technology transfer occurring when a new user applies an existing innovation developed for one purpose in a different function.		
06.02	Explain technological innovation resulting when ideas, knowledge, or skills are shared within a technology, among technologies, or across other fields.		
06.03	Discuss technological progresses that promote the advancement of science and mathematics.		
07.0	Demonstrate an understanding of the cultural, social, economic, and political effects of technology. – The student will be able to:		
07.01	Discuss changes caused by the use of technology ranging from gradual to rapid and from subtle to obvious.		
07.02	Compare the use of technology involving weighing the trade-offs between the positive and the negative effects.		
07.03	Debate the cultural, social, economic, and political changes caused by the transfer of a technology from one society to another.		
08.0	Demonstrate an understanding of the influence of technology on history. – The student will be able to:		
08.01	Discuss how technological development has been evolutionary, the result of a series of refinements to a basic invention.		
08.02	Discuss how the evolution of civilization has been directly affected by, and has in turn affected, the development and use of tools and materials.		
08.03	Research the history of technology as a powerful force in reshaping the social, cultural, political, and economic landscape.		
08.04	Discuss that early in the history of technology, the development of many tools and machines was based not on scientific knowledge but on technological know-how.		
08.05	Define the Iron Age by the use of iron and steel as the primary materials for tools.		
08.06	Define the Middle Ages by the development of many technological devices that produced long-lasting effects on technology and society.		
08.07	Define the Renaissance, a time of rebirth of the arts and humanities, as an important development in the history of technology.		
08.08	Define the Industrial Revolution as the development of continuous manufacturing, sophisticated transportation and communication systems, advanced construction practices, and improved education and leisure time.		
08.09	Define the Information Age and its placement of emphasis on the processing and exchange of information.		
09.0	Demonstrate an understanding of the attributes of design. – The student will be able to:		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
09.01	Describe the design process; including defining a problem, brainstorming, researching and generating ideas, identifying criteria and specifying constraints, exploring possibilities, selecting an approach, developing a design proposal, making a model or prototype, testing and evaluating the design using specifications, refining the design, creating or making it, and communicating processes and results.		
09.02	Translate design problems that are seldom presented in a clearly defined form.		
09.03	Check and critique a design continually, and improve and revise the idea of the design as needed.		
09.04	Analyze competing requirements of a design, such as criteria, constraints, and efficiency.		
10.0	Demonstrate an understanding of engineering design. – The student will be able to:		
10.01	Investigate design principles used to evaluate existing designs, to collect data, and to guide the design process.		
10.02	Examine the influence of personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly on the Engineering Design process.		
10.03	Construct a prototype or a working model used to test a design concept by making actual observations and necessary adjustments.		
10.04	Evaluate factors taken into account in the process of engineering.		
11.0	Demonstrate an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving. – The student will be able to:		
11.01	Employ research and development as a specific problem solving approach that is used intensively in business and industry to prepare devices and systems for the marketplace.		
11.02	Conduct research needed to solve technological problems.		
11.03	Differentiate between technological and non-technological problems, and identify which problems can be solved using technology.		
11.04	Utilize a multidisciplinary approach to solving technological problems.		
12.0	Demonstrate the abilities to apply the design process. – The student will be able to:		
12.01	Identify a design problem to solve and decide whether or not to address it.		
12.02	Identify criteria and constraints and determine how these will affect the design process.		
12.03	Refine a design by using prototypes and modeling to ensure quality, efficiency, and productivity of the final product.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	12.04 Evaluate the design solution using conceptual, physical, and mathematical models at various intervals of the design process in order to check for proper design and to note areas where improvements are needed.		
	12.05 Develop and produce a product or system using a design process.		
	12.06 Evaluate final solutions and communicate observations, processes, and results of the entire design process, using verbal, graphic, quantitative, virtual, and written means, in addition to three-dimensional models.		
13.0	Demonstrate the abilities to use and maintain technological products and systems. – The student will be able to:		
	13.01 Document processes and procedures and communicate them to different audiences using appropriate oral and written techniques.		
	13.02 Diagnose a system that is malfunctioning and use tools, materials, machines, and knowledge to repair it.		
	13.03 Troubleshoot, analyze, and maintain systems to ensure safe and proper function and precision.		
	13.04 Operate systems so that they function in the way they were designed.		
	13.05 Use computers and calculators to access, retrieve, organize, process, maintain, interpret, and evaluate data and information in order to communicate.		
14.0	Demonstrate the abilities to assess the impact of products and systems. – The student will be able to:		
	14.01 Collect information and evaluate its quality.		
	14.02 Synthesize data, analyze trends, and draw conclusions regarding the effect of technology on the individual, society, and the environment.		
	14.03 Use assessment techniques, such as trend analysis and experimentation to make decisions about the future development of technology.		
	14.04 Design forecasting techniques to evaluate the results of altering natural systems.		
15.0	Demonstrate an understanding of and be able to select and use information and communication technologies. – The student will be able to:		
	15.01 Discuss information and communication technologies including the inputs, processes, and outputs associated with sending and receiving information.		
	15.02 Classify information and communication systems that allow information to be transferred as human to human, human to machine, machine to human, or machine to machine.		
	15.03 Use information and communication systems to inform, persuade, entertain, control, manage, and educate.		
	15.04 Identify many ways to communicate information, such as graphic and electronic means.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	15.05 Communicate technological knowledge and processes using symbols, measurement, conventions, icons, graphic images, and languages that incorporate a variety of visual, auditory, and tactile stimuli.		
16.0	Demonstrate an understanding of and be able to select and use manufacturing technologies. – The student will be able to:		
	16.01 Service products to keep them in good operating condition.		
	16.02 Discuss the interchangeability of parts to increase the effectiveness of manufacturing processes.		
17.0	Demonstrate an understanding of and be able to select and use construction technologies. – The student will be able to:		
	17.01 Identify a variety of processes and procedures used in constructing structures.		
	17.02 Identify requirements involved in the design of structures.		
	17.03 Recommend maintenance, alterations, or renovations to improve a structure or alter its intended use.		
26.0	Demonstrate technical knowledge and skills for making architectural drawings to industry standards. – The student will be able to:		
	26.01 Produce a dimensioned floor plan showing walls, windows, doors, cabinets, stairs, appliances, fixtures, and other details.		
	26.02 Produce a dimensioned foundation plan with details.		
	26.03 Produce an architectural electrical plan.		
	26.04 Produce an architectural plumbing plan.		
	26.05 Produce an architectural climate control plan (HVAC).		
	26.06 Produce a dimensioned roof plan with details.		
	26.07 Produce a detailed information sheet including wall section and schedules.		
	26.08 Produce a dimensioned plot plan.		
	26.09 Produce dimensioned elevation drawings showing grade lines, floors, ceilings, windows, doors, and other details.		
27.0	Demonstrate technical knowledge and skills for making a reverse engineered drawing (as built) from a solid object. – The student will be able to:		
	27.01 Identify and apply advanced measuring tools and techniques.		
	27.02 Apply precision dimensioning standards.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	27.03 Produce a detailed multi view orthographic drawing.		
	27.04 Produce an enhanced pictorial drawing.		
	27.05 Produce an auxiliary view drawing.		
	27.06 Produce a section view drawing.		
28.0	Demonstrate technical knowledge and skills for making technical illustrations. – The student will be able to:		
	28.01 Produce a colored or shaded pictorial rendering for presentation.		
	28.02 Produce a labeled graph or chart for display.		

Florida Department of Education
Student Performance Standards

Course Title: **Drafting/Illustrative Design Technology III**
Course Number: **8600830**
Course Credit: **1**

Course Description:
This course provides students with an advanced understanding of the knowledge, human relations and technical skills of drafting and design technology.

Florida Standards			Correlation to CTE Program Standard #
29.0	Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Drafting/Illustrative Design Technology.		
	29.01 Key Ideas and Details		
	29.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. LAFS.1112.RST.1.1	
	29.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.1112.RST.1.2	
	29.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.1112.RST.1.3	
	29.02 Craft and Structure		
	29.02.1	Determine the meaning of symbols key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. LAFS.1112.RST.2.4	
	29.02.2	Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. LAFS.1112.RST.2.5	
	29.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. LAFS.1112.RST.2.6	

Florida Standards			Correlation to CTE Program Standard #
29.03	Integration of Knowledge and Ideas		
	29.03.1	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g. quantitative data, video, multimedia) in order to address a question or solve a problem. LAFS.1112.RST.3.7	
	29.03.2	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. LAFS.1112.RST.3.8	
	29.03.3	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. LAFS.1112.RST.3.9	
29.04	Range of Reading and Level of Text Complexity		
	29.04.1	By the end of grade 11, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	29.04.2	By the end of grade 12, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 11–CCR text complexity band independently and proficiently. LAFS.1112.RST.4.10	
30.0	Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Drafting/Illustrative Design Technology.		
30.01	Text Types and Purposes		
	30.01.1	Write arguments focused on discipline-specific content. LAFS.1112.WHST.1.1	
	30.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.1112.WHST.1.2	
30.02	Production and Distribution of Writing		
	30.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.1112.WHST.2.4	

Florida Standards			Correlation to CTE Program Standard #
	30.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.1112.WHST.2.5	
	30.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. LAFS.1112.WHST.2.6	
30.03	Research to Build and Present Knowledge		
	30.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.1112.WHST.3.7	
	30.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. LAFS.1112.WHST.3.8	
	30.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.1112.WHST.3.9	
30.04	Range of Writing		
	30.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.1112.WHST.4.10	
31.0	Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Drafting/Illustrative Design Technology.		
31.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1		
31.02	Reason abstractly and quantitatively. MAFS.K12.MP.2.1		
31.03	Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1		

Florida Standards	Correlation to CTE Program Standard #
31.04 Model with mathematics. MAFS.K12.MP.4.1	
31.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
31.06 Attend to precision. MAFS.K12.MP.6.1	
31.07 Look for and make use of structure. MAFS.K12.MP.7.1	
31.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
04.0 Demonstrate an understanding of the characteristics and scope of technology. – The student will be able to:		
04.01 Illustrate the nature and development of technological knowledge and processes.		
04.02 Graph the rapid increase in the rate of technological development and diffusion.		
04.03 Conduct specific goal-directed research related to inventions and innovations.		
05.0 Demonstrate an understanding of the core concepts of technology. – The student will be able to:		
05.01 Apply systems thinking logic and creativity with appropriate compromises in complex real-life problems.		
05.02 Assess technological systems, which are the building blocks of technology and are embedded within larger technological, social, and environmental systems.		
05.03 Compare resources involving trade-offs between competing values, such as availability, cost, desirability, and waste.		
05.04 Identify the criteria and constraints of a product or system and determine how they affect the final design and development.		
05.05 Propose strategies for optimization as an ongoing process or methodology of designing or making a product dependent on criteria and constraints.		
05.06 Discuss new technologies that create new processes.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
05.07	Recommend a quality control process to ensure that a product, service, or system meets established criteria.		
05.08	Organize a management system as the process of planning, organizing, and controlling work.		
06.0	Demonstrate an understanding of the relationships among technologies and the connection between technology and other fields of study. – The student will be able to:		
06.01	Create technology transfer occurring when a new user applies an existing innovation developed for one purpose in a different function.		
06.02	Examine technological innovation resulting when ideas, knowledge, or skills are shared within a technology, among technologies, or across other fields.		
06.03	Investigate technological progresses that promote the advancement of science and mathematics.		
07.0	Demonstrate an understanding of the cultural, social, economic, and political effects of technology. – The student will be able to:		
07.01	Discuss changes caused by the use of technology ranging from gradual to rapid and from subtle to obvious.		
07.02	Evaluate the use of technology involving weighing the trade-offs between the positive and the negative effects.		
07.03	Debate the cultural, social, economic, and political changes caused by the transfer of a technology from one society to another.		
08.0	Demonstrate an understanding of the influence of technology on history. – The student will be able to:		
08.01	Research how technological development has been evolutionary, the result of a series of refinements to a basic invention.		
08.02	Assess how the evolution of civilization has been directly affected by, and has in turn affected, the development and use of tools and materials.		
08.03	Research the history of technology as a powerful force in reshaping the social, cultural, political, and economic landscape.		
08.04	Debate that early in the history of technology, the development of many tools and machines was based not on scientific knowledge but on technological know-how.		
08.05	Discuss the Iron Age as the use of iron and steel as the primary materials for tools.		
08.06	Discuss the Middle Ages as the development of many technological devices that produced long-lasting effects on technology and society.		
08.07	Discuss the Renaissance, a time of rebirth of the arts and humanities, as an important development in the history of technology.		
08.08	Discuss the Industrial Revolution as the development of continuous manufacturing, sophisticated transportation and communication systems, advanced construction practices, and improved education and leisure time.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
08.09	Discuss the Information Age and its placement of emphasis on the processing and exchange of information.		
09.0	Demonstrate an understanding of the attributes of design. – The student will be able to:		
09.01	Implement the design process; including defining a problem, brainstorming, researching and generating ideas, identifying criteria and specifying constraints, exploring possibilities, selecting an approach, developing a design proposal, making a model or prototype, testing and evaluating the design using specifications, refining the design, creating or making it, and communicating processes and results.		
09.02	Translate design problems that are seldom presented in a clearly defined form.		
09.03	Evaluate a design continually, and improve and revise the idea of the design as needed.		
09.04	Analyze competing requirements of a design, such as criteria, constraints, and efficiency.		
10.0	Demonstrate an understanding of engineering design. – The student will be able to:		
10.01	Select design principles used to evaluate existing designs, to collect data, and to guide the design process.		
10.02	Examine the influence of personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly on the Engineering Design process.		
10.03	Construct a prototype or a working model used to test a design concept by making actual observations and necessary adjustments.		
10.04	Evaluate factors taken into account in the process of engineering.		
11.0	Demonstrate an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving. – The student will be able to:		
11.01	Employ research and development as a specific problem solving approach that is used intensively in business and industry to prepare devices and systems for the marketplace.		
11.02	Conduct research needed to solve technological problems.		
11.03	Differentiate between technological and non-technological problems, and identify which problems can be solved using technology.		
11.04	Utilize a multidisciplinary approach to solving technological problems.		
12.0	Demonstrate the abilities to apply the design process. – The student will be able to:		
12.01	Interpret the design problem to solve and decide whether or not to address it.		
12.02	Evaluate criteria and constraints and determine how these will affect the design process.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
12.03	Refine a design by using prototypes and modeling to ensure quality, efficiency, and productivity of the final product.		
12.04	Evaluate the design solution using conceptual, physical, and mathematical models at various intervals of the design process in order to check for proper design and to note areas where improvements are needed.		
12.05	Produce a product or system using a design process.		
12.06	Evaluate final solutions and communicate observations, processes, and results of the entire design process, using verbal, graphic, quantitative, virtual, and written means, in addition to three-dimensional models.		
13.0	Demonstrate the abilities to use and maintain technological products and systems. – The student will be able to:		
13.01	Document processes and procedures and communicate them to different audiences using appropriate oral and written techniques.		
13.02	Diagnose a system that is malfunctioning and use tools, materials, machines, and knowledge to repair it.		
13.03	Troubleshoot, analyze, and maintain systems to ensure safe and proper function and precision.		
13.04	Operate systems so that they function in the way they were designed.		
13.05	Use computers and calculators to access, retrieve, organize, process, maintain, interpret, and evaluate data and information in order to communicate.		
14.0	Demonstrate the abilities to assess the impact of products and systems. – The student will be able to:		
14.01	Collect information and evaluate its quality.		
14.02	Synthesize data, analyze trends, and draw conclusions regarding the effect of technology on the individual, society, and the environment.		
14.03	Apply assessment techniques, such as trend analysis and experimentation to make decisions about the future development of technology.		
14.04	Design forecasting techniques to evaluate the results of altering natural systems.		
15.0	Demonstrate an understanding of and be able to select and use information and communication technologies. – The student will be able to:		
15.01	Discuss information and communication technologies including the inputs, processes, and outputs associated with sending and receiving information.		
15.02	Classify information and communication systems that allow information to be transferred as human to human, human to machine, machine to human, or machine to machine.		
15.03	Use information and communication systems to inform, persuade, entertain, control, manage, and educate.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
15.04	Identify many ways to communicate information, such as graphic and electronic means.		
15.05	Communicate technological knowledge and processes using symbols, measurement, conventions, icons, graphic images, and languages that incorporate a variety of visual, auditory, and tactile stimuli.		
16.0	Demonstrate an understanding of and be able to select and use manufacturing technologies. – The student will be able to:		
16.01	Service products to keep them in good operating condition.		
16.02	Discuss the interchangeability of parts to increase the effectiveness of manufacturing processes.		
32.0	Demonstrate technical knowledge and skills for making engineering drawings. – The student will be able to:		
32.01	Produce an advanced detailed machine drawing with tolerances, hidden surfaces and other mechanical details.		
32.02	Produce detailed electrical and electronic schematics with appropriate components.		
32.03	Produce a contour map with a cut and fill drawing annotated in accordance with government codes.		
33.0	Demonstrate and present a research and design project. – The student will be able to:		
33.01	Identify and research a design problem related to one of the following technologies (medical, GIS, agriculture, energy & power, information & communication, transportation, manufacturing, and construction).		
33.02	Identify criteria and constraints.		
33.03	Produce a virtual or physical model of the solution.		
33.04	Test and evaluate the solution.		
33.05	Deliver a professional quality presentation of the design process and solution (i.e., a rendering, walk-through, fly-over, or animation of a design).		
34.0	Demonstrate an understanding of career opportunities and requirements in the field of drafting/illustrative design technology. – The student will be able to:		
34.01	Discuss individual interests related to a career in drafting/illustrative design technology.		
34.02	Explore career opportunities related to a career in drafting/illustrative design technology.		
34.03	Explore secondary education opportunities related to drafting/illustrative design technology.		
34.04	Conduct a job search.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
34.05 Complete a job application form correctly.		
34.06 Demonstrate competence in job interview techniques.		
34.07 Create a professional resume and letter of introduction.		
34.08 Solicit awards, letters of recommendation and recognition.		
34.09 Organize work samples in a professional, presentable format.		

Additional Information

Laboratory Activities

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

Career and Technical Student Organization (CTSO)

The Florida Technology Student Association (FL-TSA) is the intercurricular career and technical student organization for providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

Cooperative Training – OJT

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

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 Occupational Completion Point (OCP) or a Modified Occupational Completion Point (MOCP). If needed, a student may enroll in the same career and technical course more than once. Documentation should be included in the IEP that clearly indicates that it is anticipated that the student may need an additional year to complete an OCP/MOCP. The student should work on different competencies and new applications of competencies each year toward completion of the OCP/MOCP. After achieving the competencies identified for the year, the student earns credit for the course. It is important to ensure that credits earned by students are reported accurately. The district's information system must be designed to accept multiple credits for the same course number for eligible students with disabilities.

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

Florida Department of Education
Curriculum Framework

Program Title: **Electronics Technology**
Program Type: **Non Career Preparatory**
Career Cluster: **Engineering & Technology Education**

Secondary – Non Career Preparatory	
Program Number	8600900
CIP Number	0821010400
Grade Level	9-12; 30, 31
Standard Length	3 credits
Teacher Certification	TEC ED 1 @2 ENG @7 7G ELECTRONIC @7 7G ELECTRICAL @7 7G TEC ELEC @7
CTSO	Florida Technology Student Association (FL-TSA)
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 electronics technology. 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, the theory, use, and technical application of electronics technology. The content and activities will also include the study of entrepreneurship, safety, and leadership skills.

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

Program Structure

This program is a planned sequence of instruction consisting of three one-credit courses. The following table illustrates the program structure:

Course Number	Course Title	Length	Level	Graduation Requirement
8600910	Electronics Technology I	1 credit	2	VO
8600920	Electronics Technology II	1 credit	2	VO
8600930	Electronics Technology III	1 credit	3	VO

(Graduation Requirement Abbreviations- EQ= Equally Rigorous Science, PA= Practical Arts, EC= Economics, VO= Career and Technical Education)

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.

Academic Alignment Table

Academic alignment is an ongoing, collaborative effort of professional educators specializing in the fields of science, mathematics, English/language arts, and Career and Technical Education (CTE). This initiative supports CTE programs by improving student performance through the integration of academic content within CTE courses. Career and Technical Education courses that have been aligned to the Next Generation Sunshine State Standards for Science and the Florida Standards for Mathematics and English/Language Arts will show the following data: the quantity of academic standards in the CTE course; the total number of standards contained in the academic course; and the percentage of alignment to the CTE course.

Courses	Anatomy/ Physiology Honors	Astronomy Solar/Galactic Honors	Biology 1	Chemistry 1	Earth-Space Science	Environmental Science	Genetics	Integrated Science	Marine Science 1 Honors	Physical Science	Physics 1
8600910	**	**	**	**	**	**	**	**	**	**	**
8600920	**	**	**	**	**	**	**	**	**	**	**
8600930	**	**	**	**	**	**	**	**	**	**	**

** *Alignment pending review* # *Alignment attempted, but no correlation to academic course*

Courses	Algebra 1	Algebra 2	Geometry	English 1	English 2	English 3	English 4
8600910	**	**	**	**	**	**	**
8600920	**	**	**	**	**	**	**
8600930	**	**	**	**	**	**	**

** *Alignment pending review* # *Alignment attempted, but no correlation to academic course*

Florida Standards for Technical Subjects

Florida Standards (FS) for English Language Arts and Literacy in History/Social Studies, Science, and Technical Subjects are the critical reading and writing literacy standards designed for grade 6 and above. These standards are predicated on teachers of history/social studies, science, and technical subjects using their content area expertise to help students meet the particular challenges of reading, writing, speaking, listening, and language in their respective fields. It is important to note that the 6-12 literacy standards in history/social studies, science, and technical subjects are not meant to replace content standards in those areas but rather to supplement them.

This curriculum framework incorporates the grades 9-10 reading and writing literacy standards in the first two courses of this CTE program and grade 11-12 reading and writing literacy standards in the third and fourth courses of this CTE program. The standards for Mathematical Practices describe varieties of expertise that educators at all levels should seek to develop in their students. These practices rest on important "processes and proficiencies" with longstanding importance in mathematics education. This curriculum framework incorporates the appropriate mathematical practices in the first four courses of this CTE program.

Common Career Technical Core – Career Ready Practices

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

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

2. Apply appropriate academic and technical skills.

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

4. Communicate clearly, effectively and with reason.

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

6. Demonstrate creativity and innovation.

7. Employ valid and reliable research strategies.

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

9. Model integrity, ethical leadership and effective management.

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

11. Use technology to enhance productivity.

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

Standards

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

01.0 Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Electronics Technology.
02.0 Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Electronics Technology.
03.0 Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Electronics Technology.
04.0 Demonstrate an understanding of the characteristics and scope of technology.
05.0 Demonstrate an understanding of the core concepts of technology.
06.0 Demonstrate an understanding of the relationships among technologies and the connections between technology and other fields of study.
07.0 Demonstrate an understanding of the cultural, social, economic, and political effects of technology.
08.0 Demonstrate an understanding of the effects of technology on the environment.
09.0 Demonstrate an understanding of the role of society in the development and use of technology.
10.0 Demonstrate an understanding of the influence of technology on history.
11.0 Demonstrate an understanding of the attributes of design.
12.0 Demonstrate an understanding of engineering design.
13.0 Demonstrate an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving.
14.0 Demonstrate abilities to apply the design process.
15.0 Demonstrate the abilities to use and maintain technological products and systems.
16.0 Demonstrate the abilities to assess the impact of products and systems.
17.0 Demonstrate an understanding of and be able to select and use energy and power technologies.
18.0 Demonstrate an understanding of and be able to select and use information and communication technologies.
19.0 Demonstrate safe and appropriate use of tools, machines, and materials in electronics technology.
20.0 Describe the structure of matter related to electronics.
21.0 Describe, construct, conduct, and analyze experiments with basic DC and AC circuits and with circuits using magnetism.
22.0 Identify, measure, and describe the function of transformers and inductors in electronic circuits.
23.0 Use Ohm's law and Watt's law to analyze and experiment with resistive circuits.
24.0 Describe, construct, analyze and experiment with capacitive circuits.
25.0 Demonstrate the use of electronic equipment.
26.0 Demonstrate proper electronic assembly methods.
27.0 Demonstrate an understanding of basic electrical circuits and electronic systems.
28.0 Describe and experiment with integrated circuits.
29.0 Describe, construct, and experiment with circuits using semiconductors.
30.0 Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Electronics Technology.
31.0 Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Electronics Technology.

32.0 Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Electronics Technology.
33.0 Perform advanced study and skills related to electronics.
34.0 Demonstrate an understanding of the principles and applications of microcomputer systems.
35.0 Describe, identify, and correct problems in electronic circuits.
36.0 Demonstrate technical knowledge and skills about electronic networks and systems.
37.0 Conduct a research and experimentation project on an electronic system or process.
38.0 Demonstrate an understanding of career opportunities and requirements in the field of electronics technology.

Florida Department of Education
Student Performance Standards

Course Title: **Electronics Technology I**
Course Number: **8600910**
Course Credit: **1**

Course Description:
This course provides students with an introduction to the knowledge, human relations, and technical skills of electronics technology.

Florida Standards			Correlation to CTE Program Standard #
01.0	Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Electronics Technology.		
	01.01 Key Ideas and Details		
	01.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. LAFS.910.RST.1.1	
	01.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.910.RST.1.2	
	01.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.910.RST.1.3	
	01.02 Craft and Structure		
	01.02.1	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. LAFS.910.RST.2.4	
	01.02.2	Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). LAFS.910.RST.2.5	
	01.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. LAFS.910.RST.2.6	

Florida Standards			Correlation to CTE Program Standard #
01.03	Integration of Knowledge and Ideas		
	01.03.1	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. LAFS.910.RST.3.7	
	01.03.2	Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. LAFS.910.RST.3.8	
	01.03.3	Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. LAFS.910.RST.3.9	
01.04	Range of Reading and Level of Text Complexity		
	01.04.1	By the end of grade 9, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	01.04.2	By the end of grade 10, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 9–10 text complexity band independently and proficiently. LAFS.910.RST.4.10	
02.0	Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Electronics Technology.		
02.01	Text Types and Purposes		
	02.01.1	Write arguments focused on discipline-specific content. LAFS.910.WHST.1.1	
	02.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.910.WHST.1.2	
02.02	Production and Distribution of Writing		
	02.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.910.WHST.2.4	
	02.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.910.WHST.2.5	

Florida Standards			Correlation to CTE Program Standard #
	02.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. LAFS.910.WHST.2.6	
02.03	Research to Build and Present Knowledge		
	02.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.910.WHST.3.7	
	02.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. LAFS.910.WHST.3.8	
	02.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.910.WHST.3.9	
02.04	Range of Writing		
	02.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.910.WHST.4.10	
03.0	Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Electronics Technology.		
03.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1		
03.02	Reason abstractly and quantitatively. MAFS.K12.MP.2.1		
03.03	Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1		
03.04	Model with mathematics. MAFS.K12.MP.4.1		
03.05	Use appropriate tools strategically. MAFS.K12.MP.5.1		

Florida Standards	Correlation to CTE Program Standard #
03.06 Attend to precision. MAFS.K12.MP.6.1	
03.07 Look for and make use of structure. MAFS.K12.MP.7.1	
03.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
04.0	Demonstrate an understanding of the characteristics and scope of technology. – The student will be able to:		
04.01	Describe the nature and development of technological knowledge and processes.		
04.02	Conduct specific goal-directed research related to inventions and innovations.		
05.0	Demonstrate an understanding of the core concepts of technology. – The student will be able to:		
05.01	Identify systems thinking logic and creativity with appropriate compromises in complex real-life problems.		
05.02	Define technological systems, which are the building blocks of technology and are embedded within larger technological, social, and environmental systems.		
05.03	Identify resources involving trade-offs between competing values, such as availability, cost, desirability, and waste.		
05.04	Identify the criteria and constraints of a product or system and then determine how they affect the final design and development.		
05.05	Define a management system as the process of planning, organizing, and controlling work.		
06.0	Demonstrate an understanding of the relationships among technologies and the connections between technology and other fields of study. – The student will be able to:		
06.01	Discuss technology transfer occurring when a new user applies an existing innovation developed for one purpose in a different function.		
06.02	Identify technological innovations resulting when ideas, knowledge, or skills are shared within a technology, among technologies, or across other fields.		
06.03	Outline the process of patenting to protect a technological idea.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	06.04 Identify technological progresses that promote the advancement of science and mathematics.		
07.0	Demonstrate an understanding of the cultural, social, economic, and political effects of technology. – The student will be able to:		
	07.01 Identify changes in society caused by the use of technology.		
	07.02 Describe how the use of technology involves weighing trade-offs between the positive and the negative effects.		
08.0	Demonstrate an understanding of the effects of technology on the environment. – The student will be able to:		
	08.01 Compare trade-offs of developing technologies to reduce the use of resources.		
	08.02 Assess technologies devised to reduce the negative consequences of other technologies.		
	08.03 Make decisions about the implementation of technologies involving the weighing of trade-offs between predicted positive and negative effects on the environment.		
09.0	Demonstrate an understanding of the role of society in the development and use of technology. – The student will be able to:		
	09.01 Investigate how different cultures develop their own technologies to satisfy their individual and shared needs, wants, and values.		
	09.02 Collect societal opinions and demands, as well as corporate cultures to use as a basis for deciding whether or not to develop a technology.		
	09.03 Identify a number of different factors, such as advertising, the strength of the economy, the goals of a company, and the latest fads as contributors to shaping the design of and demand for various technologies.		
10.0	Demonstrate an understanding of the influence of technology on history. – The student will be able to:		
	10.01 Describe how the evolution of civilization has been directly affected by, and has in turn affected the development and use of tools and materials.		
	10.02 Describe how technology has been a powerful force in reshaping social, cultural, political, and economic landscapes throughout history.		
11.0	Demonstrate an understanding of the attributes of design. – The student will be able to:		
	11.01 Recognize the design process; including defining a problem, brainstorming, researching and generating ideas, identifying criteria and specifying constraints, exploring possibilities, selecting an approach, developing a design proposal, making a model or prototype, testing and evaluating the design using specifications, refining the design, creating or making it, and communicating processes and results.		
	11.02 Describe why design problems that are seldom presented in a clearly defined form.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
11.03	Explain why a design must be continually checked and critiqued.		
11.04	Give examples of competing requirements of a design, such as criteria, constraints, and efficiency.		
12.0	Demonstrate an understanding of engineering design. – The student will be able to:		
12.01	Identify design principles used to evaluate existing designs, to collect data, and to guide the design process.		
12.02	Describe the influence of personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly on the engineering design process.		
12.03	Construct a prototype or working model used to test a design concept by making actual observations and necessary adjustments.		
12.04	Identify factors taken into account in the process of engineering.		
13.0	Demonstrate an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving. – The student will be able to:		
13.01	Define research and development as a specific problem solving approach that is used intensively in business and industry to prepare devices and systems for the marketplace.		
13.02	Describe why research needed to solve technological problems.		
13.03	Explain why some problems have technological solutions while others have non-technological solutions..		
13.04	Explain why a multidisciplinary approach to solving technological problems.		
14.0	Demonstrate the abilities to apply the design process. – The student will be able to:		
14.01	Identify the design problem to solve and decide whether or not to address it.		
14.02	List criteria and constraints and determine how these will affect the design process.		
14.03	Refine a design by using prototypes and modeling to ensure quality, efficiency, and productivity of the final product.		
14.04	Evaluate the design solution using conceptual, physical, and mathematical models at various intervals of the design process in order to check for proper design and to note areas where improvements are needed.		
14.05	Develop a product or system using a design process.		
14.06	Evaluate final solutions and communicate observations, processes, and results of the entire design process, using verbal, graphic, quantitative, virtual, and written means, in addition to three-dimensional models.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
15.0	Demonstrate the abilities to use and maintain technological products and systems. – The student will be able to:		
15.01	Document processes and procedures and communicate them to different audiences using appropriate oral and written techniques.		
15.02	Diagnose a system that is malfunctioning and use tools, materials, machines, and knowledge to repair it.		
15.03	Troubleshoot, analyze, and maintain systems to ensure safe and proper function and precision.		
15.04	Operate systems so that they function in the way they were designed.		
15.05	Use computers and calculators to access, retrieve, organize, process, maintain, interpret, and evaluate data and information in order to communicate.		
16.0	Demonstrate the abilities to assess the impact of products and systems. – The student will be able to:		
16.01	Collect information and evaluate its quality.		
16.02	Synthesize data, analyze trends, and draw conclusions regarding the effect of technology on the individual, society, and the environment.		
16.03	Define assessment techniques, such as trend analysis and experimentation to make decisions about the future development of technology.		
16.04	Identify forecasting techniques to evaluate the results of altering natural systems.		
17.0	Demonstrate an understanding of and be able to select and use energy and power technologies. – The student will be able to:		
17.01	Discuss how energy cannot be created nor destroyed; however, it can be converted from one form to another.		
17.02	Construct a power system having a source of energy, a process, and loads.		
18.0	Demonstrate an understanding of and be able to select and use information and communication technologies. – The student will be able to:		
18.01	Classify information and communication systems that allow information to be transferred as human to human, human to machine, machine to human, or machine to machine.		
18.02	Use information and communication systems to inform, persuade, entertain, control, manage, and educate.		
19.0	Demonstrate safe and appropriate use of tools, machines, and materials in electronics technology. – The student will be able to:		
19.01	Select appropriate tools, procedures, and/or equipment.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	19.02 Demonstrate the safe usage of appropriate tools, procedures, and operation of equipment.		
	19.03 Follow laboratory safety rules and procedures.		
	19.04 Demonstrate good housekeeping at workstation within total laboratory.		
	19.05 Identify color-coding safety standards.		
	19.06 Explain fire prevention and safety precautions and practices for extinguishing fires.		
	19.07 Identify harmful effects/potential dangers of familiar hazardous substances/devices to people and the environment.		
20.0	Describe the structure of matter related to electronics. – The student will be able to:		
	20.01 Describe the composition of elements, mixtures, and compounds according to the electron theory.		
	20.02 List the atomic sub-particles.		
	20.03 Diagram and show the relationship between electrons, protons, and neutrons.		
	20.04 State the law of electrical charges.		
	20.05 Describe the classification and characteristics of materials as they apply to conductor, insulators, and semiconductors.		
	20.06 Demonstrate proficiency in the identification of electronics symbols.		
21.0	Describe, construct, conduct, and analyze experiments with basic DC and AC circuits and with circuits using magnetism. – The student will be able to:		
	21.01 Solve math problems related to DC and AC circuits.		
	21.02 Define voltage, current, resistance, power, and energy.		
	21.03 Set up and test basic circuits.		
	21.04 Set up and operate multimeters in DC and AC circuits.		
	21.05 Set up and operate power supplies in DC circuits.		
	21.06 Describe magnetism, the law of magnetic poles, and the behavior of flux lines.		
	21.07 Demonstrate electromagnetism.		
	21.08 Construct simple circuits using a relay.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
22.0	Identify, measure, and describe the function of transformers and inductors in electronic circuits. – The student will be able to:		
22.01	Explain the theory of operation and application of inductance in inductors and transformers.		
22.02	Explain what an inductor is and what its purpose is.		
22.03	Construct circuits using transformers and inductors.		
22.04	Explain inductive reactance.		
23.0	Use Ohm's law and Watt's law to analyze and experiment with resistive circuits. – The student will be able to:		
23.01	Identify resistors by color code.		
23.02	Identify and measure resistors.		
23.03	Apply Ohm's law to circuits.		
23.04	Explain how resistors are constructed.		
23.05	Apply Watt's law to circuits.		
23.06	Identify different types of resistors, and explain their use and ratings.		
24.0	Describe, construct, analyze and experiment with capacitive circuits. – The student will be able to:		
24.01	Explain how a capacitor stores electrical energy.		
24.02	Explain how a capacitor is constructed.		
24.03	Explain capacitive reactance.		
25.0	Demonstrate the use of electronic equipment. – The student will be able to:		
25.01	Use a VOM to obtain accurate measurements.		
25.02	Apply safety rules in the use of electronic instruments and demonstrate proper care and maintenance for the equipment during storage and use.		
25.03	Use voltmeters, ammeters, and ohmmeters to obtain accurate measurements.		
25.04	Set up and use an oscilloscope to observe waveforms and to determine the voltage of the signal presented.		
25.05	Use signal generators to produce waveforms of selected frequencies and shapes.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	25.06 Use testers to determine the condition of electronic components.		
26.0	Demonstrate proper electronic assembly methods. – The student will be able to:		
	26.01 Exhibit safe soldering techniques.		
	26.02 Identify proper soldering practices.		
	26.03 Demonstrate proper soldering applications.		
	26.04 Identify common electrical and electronics hand tools.		
	26.05 Demonstrate electronic component assembly.		
	26.06 Apply electrical tape to a spliced and soldered wire connection.		
	26.07 Solder and de-solder components and wires.		
	26.08 Describe the two methods of making a printed circuit board.		
27.0	Demonstrate an understanding of basic electrical circuits and electronic systems. – The student will be able to:		
	27.01 Identify problems and demonstrate appropriate solutions when dealing with series, series-parallel, parallel, voltage dividers, and network circuits.		
	27.02 Define electronic systems.		
	27.03 Describe the importance of electronic systems in today's technology world.		
	27.04 Define electronics input, process and output of electronic systems.		
	27.05 Conduct electronic experiments using input, process and output systems.		
	27.06 Describe, design and conduct experiments with electronic systems.		

Florida Department of Education
Student Performance Standards

Course Title: **Electronics Technology II**
Course Number: **8600920**
Course Credit: **1**

Course Description:
This course provides students with an intermediate understanding of the knowledge, human relations, and technical skills of electronics technology.

Florida Standards			Correlation to CTE Program Standard #
01.0	Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Electronics Technology.		
	01.01 Key Ideas and Details		
	01.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. LAFS.910.RST.1.1	
	01.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.910.RST.1.2	
	01.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.910.RST.1.3	
	01.02 Craft and Structure		
	01.02.1	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. LAFS.910.RST.2.4	
	01.02.2	Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). LAFS.910.RST.2.5	
	01.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. LAFS.910.RST.2.6	

Florida Standards			Correlation to CTE Program Standard #
01.03	Integration of Knowledge and Ideas		
	01.03.1	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. LAFS.910.RST.3.7	
	01.03.2	Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. LAFS.910.RST.3.8	
	01.03.3	Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. LAFS.910.RST.3.9	
01.04	Range of Reading and Level of Text Complexity		
	01.04.1	By the end of grade 9, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	01.04.2	By the end of grade 10, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 9–10 text complexity band independently and proficiently. LAFS.910.RST.4.10	
02.0	Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Electronics Technology.		
02.01	Text Types and Purposes		
	02.01.1	Write arguments focused on discipline-specific content. LAFS.910.WHST.1.1	
	02.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.910.WHST.1.2	
02.02	Production and Distribution of Writing		
	02.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.910.WHST.2.4	
	02.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.910.WHST.2.5	

Florida Standards			Correlation to CTE Program Standard #
	02.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. LAFS.910.WHST.2.6	
02.03	Research to Build and Present Knowledge		
	02.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.910.WHST.3.7	
	02.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. LAFS.910.WHST.3.8	
	02.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.910.WHST.3.9	
02.04	Range of Writing		
	02.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.910.WHST.4.10	
03.0	Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Electronics Technology.		
03.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1		
03.02	Reason abstractly and quantitatively. MAFS.K12.MP.2.1		
03.03	Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1		
03.04	Model with mathematics. MAFS.K12.MP.4.1		
03.05	Use appropriate tools strategically. MAFS.K12.MP.5.1		

Florida Standards	Correlation to CTE Program Standard #
03.06 Attend to precision. MAFS.K12.MP.6.1	
03.07 Look for and make use of structure. MAFS.K12.MP.7.1	
03.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
04.0	Demonstrate an understanding of the characteristics and scope of technology. – The student will be able to:		
04.01	Discuss the nature and development of technological knowledge and processes.		
04.02	Explain the rapid increase in the rate of technological development and diffusion.		
04.03	Conduct specific goal-directed research related to inventions and innovations.		
04.04	Discuss current technological developments that are/were driven by profit motive and the market.		
05.0	Demonstrate an understanding of the core concepts of technology. – The student will be able to:		
05.01	Apply systems thinking logic and creativity with appropriate compromises in complex real-life problems.		
05.02	Discuss technological systems, which are the building blocks of technology and are embedded within larger technological, social, and environmental systems.		
05.03	Select resources involving trade-offs between competing values, such as availability, cost, desirability, and waste.		
05.04	Identify the criteria and constraints of a product or system and determine how they affect the final design and development.		
05.05	Discuss new technologies that create new processes.		
05.06	Organize a management system as the process of planning, organizing, and controlling work.		
06.0	Demonstrate an understanding of the relationships among technologies and the connections between technology and other fields of study. – The student will be able to:		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
06.01	Identify technology transfer occurring when a new user applies an existing innovation developed for one purpose in a different function.		
06.02	Outline the process of patenting to protect a technological idea.		
06.03	Identify technological progresses that promote the advancement of science and mathematics.		
07.0	Demonstrate an understanding of the cultural, social, economic, and political effects of technology. – The student will be able to:		
07.01	Discuss the cultural, social, economic, and political changes caused by the use of technology.		
07.02	Illustrate how the use of technology involves weighing trade-offs between the positive and the negative effects.		
07.03	Describe how a transfer of technology from one society to another can result in cultural, social, economic, and political changes to both societies.		
08.0	Demonstrate an understanding of the effects of technology on the environment. – The student will be able to:		
08.01	List trade-offs of developing technologies to reduce the use of resources.		
08.02	Identify technologies devised to reduce the negative consequences of other technologies.		
08.03	Discuss the implementation of technologies involving the weighing of trade-offs between predicted positive and negative effects on the environment.		
09.0	Demonstrate an understanding of the role of society in the development and use of technology. – The student will be able to:		
09.01	Report how different cultures develop their own technologies to satisfy their individual and shared needs, wants, and values.		
09.02	Consider societal opinions and demands, as well as corporate cultures to use as a basis for deciding whether or not to develop a technology.		
09.03	Consider a number of different factors, such as advertising, the strength of the economy, the goals of a company, and the latest fads as contributors to shaping the design of and demand for various technologies.		
10.0	Demonstrate an understanding of the influence of technology on history. – The student will be able to:		
10.01	Illustrate how technology has been a powerful force in reshaping social, cultural, political, and economic landscapes throughout history.		
10.02	Explain how the development of many tools and machines was based not on scientific knowledge but on technological know-how.		
11.0	Demonstrate an understanding of the attributes of design. – The student will be able to:		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
11.01	Describe the design process; including defining a problem, brainstorming, researching and generating ideas, identifying criteria and specifying constraints, exploring possibilities, selecting an approach, developing a design proposal, making a model or prototype, testing and evaluating the design using specifications, refining the design, creating or making it, and communicating processes and results.		
11.02	Explain how a design problem is not being clearly presented.		
11.03	Critique a design and describe how to improve it by redefining the ideas of the design.		
11.04	Analyze the competing requirements of a design and describe how the design might be modified to accommodate the requirements.		
12.0	Demonstrate an understanding of engineering design. – The student will be able to:		
12.01	Investigate design principles used to evaluate existing designs, to collect data, and to guide the design process.		
12.02	Examine the influence of personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly on the engineering design process.		
12.03	Construct a prototype or working model used to test a design concept by making actual observations and necessary adjustments.		
12.04	Consider factors taken into account in the process of engineering.		
13.0	Demonstrate an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving. – The student will be able to:		
13.01	Describe how research and development is used in business and industry to prepare devices and systems for the marketplace.		
13.02	Illustrate how research is used to solve technological problems.		
13.03	Differentiate between problems having technological and non-technological solutions.		
13.04	Give examples of technological problems which require a multidisciplinary approach.		
14.0	Demonstrate the abilities to apply the design process. – The student will be able to:		
14.01	Interpret the design problem to solve and decide whether or not to address it.		
14.02	Evaluate the criteria and constraints and determine how these will affect the design process.		
14.03	Refine a design by using prototypes and modeling to ensure quality, efficiency, and productivity of the final product.		
14.04	Evaluate the design solution using conceptual, physical, and mathematical models at various intervals of the design process in order to check for proper design and to note areas where improvements are needed.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	14.05 Produce a product or system using a design process.		
	14.06 Evaluate final solutions and communicate observations, processes, and results of the entire design process, using verbal, graphic, quantitative, virtual, and written means, in addition to three-dimensional models.		
15.0	Demonstrate the abilities to use and maintain technological products and systems. – The student will be able to:		
	15.01 Document processes and procedures and communicate them to different audiences using appropriate oral and written techniques.		
	15.02 Diagnose a system that is malfunctioning and use tools, materials, machines, and knowledge to repair it.		
	15.03 Troubleshoot, analyze, and maintain systems to ensure safe and proper function and precision.		
	15.04 Operate systems so that they function in the way they were designed.		
	15.05 Use computers and calculators to access, retrieve, organize, process, maintain, interpret, and evaluate data and information in order to communicate.		
16.0	Demonstrate the abilities to assess the impact of products and systems. – The student will be able to:		
	16.01 Collect information and evaluate its quality.		
	16.02 Synthesize data, analyze trends, and draw conclusions regarding the effect of technology on the individual, society, and the environment.		
	16.03 Apply assessment techniques, such as trend analysis and experimentation to make decisions about the future development of technology.		
	16.04 Design forecasting techniques to evaluate the results of altering natural systems.		
17.0	Demonstrate an understanding of and be able to select and use energy and power technologies. – The student will be able to:		
	17.01 Discuss how energy cannot be created nor destroyed; however, it can be converted from one form to another.		
	17.02 Construct a power system having a source of energy, a process, and loads.		
18.0	Demonstrate an understanding of and be able to select and use information and communication technologies. – The student will be able to:		
	18.01 Classify information and communication systems that allow information to be transferred as human to human, human to machine, machine to human, or machine to machine.		
	18.02 Use information and communication systems to inform, persuade, entertain, control, manage, and educate.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
19.0	Demonstrate safe and appropriate use of tools, machines, and materials in electronics technology. – The student will be able to:		
19.01	Select appropriate tools, procedures, and/or equipment.		
19.02	Demonstrate the safe usage of appropriate tools, procedures, and operation of equipment.		
19.03	Follow laboratory safety rules and procedures.		
19.04	Demonstrate good housekeeping at workstation within total laboratory.		
19.05	Identify color-coding safety standards.		
19.06	Explain fire prevention and safety precautions and practices for extinguishing fires.		
19.07	Identify harmful effects/potential dangers of familiar hazardous substances/devices to people and the environment.		
20.0	Describe the structure of matter related to electronics. – The student will be able to:		
20.01	Describe the composition of element, mixtures, and compounds according to the electron theory.		
20.02	List the atomic sub-particles.		
20.03	Diagram and show the relationship between electrons, protons, and neutrons.		
20.04	State the law of electrical charges.		
20.05	Describe the classification and characteristics of materials as they apply to conductors, insulators, and semiconductors.		
20.06	Demonstrate proficiency in the identification of electronics symbols.		
21.0	Describe, construct, conduct, and analyze experiments with basic DC and AC circuits and with circuits using magnetism. – The student will be able to:		
21.01	Solve electronic math problems related to DC and AC circuits.		
21.02	Define voltage, current, resistance, power, and energy.		
21.03	Set up and test basic circuits.		
21.04	Set up and operate multimeters in DC and AC circuits.		
21.05	Set up and operate power supplies in DC circuits.		
21.06	Describe magnetism, the law of magnetic poles, and the behavior of flux lines.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	21.07 Demonstrate electromagnetism.		
	21.08 Construct simple circuits using a relay.		
22.0	Identify, measure, and describe the function of transformers and inductors in electronic circuits. – The student will be able to:		
	22.01 Explain the theory of operation and application of inductance in inductors and transformers.		
	22.02 Explain what an inductor is and what its purpose is.		
	22.03 Construct circuits using transformers and inductors.		
	22.04 Explain inductive reactance.		
23.0	Use Ohm's law and Watt's law to analyze and experiment with resistive circuits. – The student will be able to:		
	23.01 Identify resistors by color code.		
	23.02 Identify and measure resistors.		
	23.03 Apply Ohm's law to circuits.		
	23.04 Explain how resistors are constructed.		
	23.05 Apply Watt's law to circuits.		
	23.06 Use a VOM to verify values.		
	23.07 Identify different types of resistors, and explain their use ratings.		
24.0	Describe, construct, analyze and experiment with capacitive circuits. – The student will be able to:		
	24.01 Explain how a capacitor stores electrical energy.		
	24.02 Explain how a capacitor is constructed.		
	24.03 Explain capacitive reactance.		
25.0	Demonstrate the use of electronic equipment. – The student will be able to:		
	25.01 Use a VOM to obtain accurate measurements.		
	25.02 Apply safety rules in the use of electronic instruments and demonstrate proper care and maintenance for the equipment during storage and use.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
25.03	Use voltmeters, ammeters, and ohmmeters to obtain accurate measurements.		
25.04	Set up and use an oscilloscope to observe waveforms and to determine the voltage of the signal presented.		
25.05	Use signal generators to produce waveforms of selected frequencies and shapes.		
25.06	Use testers to determine the condition of electronic components.		
27.0	Demonstrate an understanding of basic electrical circuits and electronic systems. – The student will be able to:		
27.01	Identify problems and demonstrate appropriate solutions when dealing with series, series-parallel, parallel, voltage dividers, and network circuits.		
27.02	Define electronic systems.		
27.03	Describe the importance of electronic systems in today's technology world.		
27.04	Define electronic input, process and output of electronic systems.		
27.05	Conduct electronic experiments using input, process and output systems.		
27.06	Describe, design and conduct experiments with electronic systems.		
27.07	Define and give an example of a super conductor.		
28.0	Describe and experiment with integrated circuits. – The student will be able to:		
28.01	Explain what integrated circuits (IC's) are and how they are manufactured.		
28.02	Explain the advantages of integrated circuits as compared to discrete component circuits.		
28.03	Construct electronic circuits that contain ICs.		
28.04	Describe the basic types of integrated circuit design, along with their pin numbering systems and dimensions.		
29.0	Describe, construct, and experiment with circuits using semiconductors. – The student will be able to:		
29.01	Describe the general theory and application of semiconductor devices.		
29.02	Explain the difference between N-type and P-type material.		
29.03	Explain the precautions necessary when working with solid state devices.		
29.04	Demonstrate the proper procedures for the installation of solid state components using thermal release devices (heat sinks).		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
29.05	Construct and experiment with semiconductor devices.		
29.06	Construct and test circuits which contain solid state components such as FET'S, SCR's, UJT's, tunnel diodes, Zener diodes, light emitting diodes, etc.		

Florida Department of Education
Student Performance Standards

Course Title: **Electronics Technology III**
Course Number: **8600930**
Course Credit: **1**

Course Description:
This course provides students with an advanced understanding of the knowledge, human relations, and technical skills of electronics technology.

Florida Standards			Correlation to CTE Program Standard #
30.0	Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Electronics Technology.		
	30.01 Key Ideas and Details		
	30.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. LAFS.1112.RST.1.1	
	30.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.1112.RST.1.2	
	30.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.1112.RST.1.3	
	30.02 Craft and Structure		
	30.02.1	Determine the meaning of symbols key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. LAFS.1112.RST.2.4	
	30.02.2	Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. LAFS.1112.RST.2.5	
	30.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. LAFS.1112.RST.2.6	

Florida Standards			Correlation to CTE Program Standard #
30.03	Integration of Knowledge and Ideas		
	30.03.1	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g. quantitative data, video, multimedia) in order to address a question or solve a problem. LAFS.1112.RST.3.7	
	30.03.2	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. LAFS.1112.RST.3.8	
	30.03.3	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. LAFS.1112.RST.3.9	
30.04	Range of Reading and Level of Text Complexity		
	30.04.1	By the end of grade 11, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	30.04.2	By the end of grade 12, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 11–CCR text complexity band independently and proficiently. LAFS.1112.RST.4.10	
31.0	Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Electronics Technology.		
31.01	Text Types and Purposes		
	31.01.1	Write arguments focused on discipline-specific content. LAFS.1112.WHST.1.1	
	31.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.1112.WHST.1.2	
31.02	Production and Distribution of Writing		
	31.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.1112.WHST.2.4	

Florida Standards			Correlation to CTE Program Standard #
	31.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.1112.WHST.2.5	
	31.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. LAFS.1112.WHST.2.6	
	31.03	Research to Build and Present Knowledge	
	31.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.1112.WHST.3.7	
	31.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. LAFS.1112.WHST.3.8	
	31.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.1112.WHST.3.9	
	31.04	Range of Writing	
	31.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.1112.WHST.4.10	
32.0	Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Electronics Technology.		
	32.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	
	32.02	Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
	32.03	Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	

Florida Standards	Correlation to CTE Program Standard #
32.04 Model with mathematics. MAFS.K12.MP.4.1	
32.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
32.06 Attend to precision. MAFS.K12.MP.6.1	
32.07 Look for and make use of structure. MAFS.K12.MP.7.1	
32.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
04.0 Demonstrate an understanding of the characteristics and scope of technology. – The student will be able to:		
04.01 Illustrate the rapid increase in the rate of technological development and diffusion.		
04.02 Conduct specific goal-directed research related to inventions and innovations.		
04.03 Evaluate current technological developments that are/were driven by profit motive and the market.		
05.0 Demonstrate an understanding of the core concepts of technology. – The student will be able to:		
05.01 Demonstrate systems thinking logic and creativity with appropriate compromises in complex real-life problems.		
05.02 Assess technological systems, which are the building blocks of technology and are embedded within larger technological, social, and environmental systems.		
05.03 Evaluate the stability of a technological system and its influence by all of the components in the system, especially those in the feedback loop.		
05.04 Compare resources involving trade-offs between competing values, such as availability, cost, desirability, and waste.		
05.05 Evaluate the criteria and constraints of a product or system and then determine how they affect the final design and development.		
05.06 Propose strategies for optimizing a technological process or methodology of designing or making a product, dependent on criteria and constraints.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	05.07 Evaluate a management system in terms of how work is planned, organized, and controlled.		
	05.08 Describe how complex systems have many layers of controls and feedback loops to provide information.		
06.0	Demonstrate an understanding of the relationships among technologies and the connections between technology and other fields of study. – The student will be able to:		
	06.01 Create technology transfer occurring when a new user applies an existing innovation developed for one purpose in a different function.		
	06.02 Outline the process of patenting to protect a technological idea.		
	06.03 Investigate technological progresses that promote the advancement of science and mathematics.		
07.0	Demonstrate an understanding of the cultural, social, economic, and political effects of technology. – The student will be able to:		
	07.01 Examine how the use of technology involves weighing the trade-offs between the positive and the negative effects.		
	07.02 Evaluate the cultural, social, economic, and political changes caused by the transfer of a technology from one society to another.		
08.0	Demonstrate an understanding of the effects of technology on the environment. – The student will be able to:		
	08.01 Compare trade-offs of developing technologies to reduce the use of resources.		
	08.02 Assess technologies devised to reduce the negative consequences of other technologies.		
	08.03 Make decisions about the implementation of technologies involving the weighing of trade-offs between predicted positive and negative effects on the environment.		
09.0	Demonstrate an understanding of the role of society in the development and use of technology. – The student will be able to:		
	09.01 Investigate how different cultures develop their own technologies to satisfy their individual and shared needs, wants, and values.		
	09.02 Collect societal opinions and demands, as well as corporate cultures to use as a basis for deciding whether or not to develop a technology.		
	09.03 Identify a number of different factors, such as advertising, the strength of the economy, the goals of a company, and the latest fads as contributors to shaping the design of and demand for various technologies.		
10.0	Demonstrate an understanding of the influence of technology on history. – The student will be able to:		
	10.01 Research how the evolution of civilization has been directly affected by, and has in turn affected, the development and use of tools and materials.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
10.02	Describe the history of technology as a powerful force in reshaping the social, cultural, political, and economic landscape.		
10.03	Discuss that early in the history of technology, the development of many tools and machines was based not on scientific knowledge, but on technological know-how.		
10.04	Define the Iron Age as the use of iron and steel as the primary materials for tools.		
10.05	Define the Middle Ages and its development of many technological devices that produced long-lasting effects on technology and society.		
10.06	Define the Renaissance, a time of rebirth of the arts and humanities, as an important development in the history of technology.		
10.07	Define the Industrial Revolution as the development of continuous manufacturing, improved education and leisure time.		
10.08	Define the Information Age and its placement of emphasis on the processing and exchange of information.		
11.0	Demonstrate an understanding of the attributes of design. – The student will be able to:		
11.01	Implement the design process; including defining a problem, brainstorming, researching and generating ideas, identifying criteria and specifying constraints, exploring possibilities, selecting an approach, developing a design proposal, making a model or prototype, testing and evaluating the design using specifications, refining the design, creating or making it, and communicating processes and results.		
11.02	Restate a design problem that is not presented in a clearly defined form.		
11.03	Evaluate a design and revise the idea of the design as needed.		
11.04	Assess the competing requirements of a design, such as criteria, constraints, and efficiency.		
12.0	Demonstrate an understanding of engineering design. – The student will be able to:		
12.01	Select design principles used to evaluate existing designs, to collect data, and to guide the design process.		
12.02	Examine the influence of personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly on the engineering design process.		
12.03	Construct a prototype or working model used to test a design concept by making actual observations and necessary adjustments.		
12.04	Evaluate factors taken into account in the process of engineering.		
13.0	Demonstrate an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving. – The student will be able to:		
13.01	Examine research and development approaches used in business and industry to prepare devices and systems for the marketplace.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
13.02	Evaluate research used to solve technological problems.		
13.03	Differentiate between technological and non-technological problems, and identify which problems can be solved using technology.		
13.04	Utilize a multidisciplinary approach to solving technological problems.		
14.0	Demonstrate the abilities to apply the design process. – The student will be able to:		
14.01	Evaluate the design problem to solve and decide whether or not to address it.		
14.02	Discriminate among criteria and constraints and adapt the design process accordingly.		
14.03	Refine a design by using prototypes and modeling to ensure quality, efficiency, and productivity of the final product.		
14.04	Evaluate the design solution using conceptual, physical, and mathematical models at various intervals of the design process in order to check for proper design and to note areas where improvements are needed.		
14.05	Produce a product or system using a design process.		
14.06	Evaluate final solutions and communicate observations, processes, and results of the entire design process, using verbal, graphic, quantitative, virtual, and written means, in addition to three-dimensional models.		
15.0	Demonstrate the abilities to use and maintain technological products and systems. – The student will be able to:		
15.01	Document processes and procedures and communicate them to different audiences using appropriate oral and written techniques.		
15.02	Diagnose a system that is malfunctioning and use tools, materials, machines, and knowledge to repair it.		
15.03	Troubleshoot, analyze, and maintain systems to ensure safe and proper function and precision.		
15.04	Operate systems so that they function in the way they were designed.		
15.05	Use computers and calculators to access, retrieve, organize, process, maintain, interpret, and evaluate data and information in order to communicate.		
16.0	Demonstrate the abilities to assess the impact of products and systems. – The student will be able to:		
16.01	Collect information and evaluate its quality.		
16.02	Synthesize data, analyze trends, and draw conclusions regarding the effect of technology on the individual, society, and the environment.		
16.03	Apply assessment techniques, such as trend analysis and experimentation to make decisions about the future development of technology.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	16.04 Use forecasting techniques to evaluate the results of altering natural systems.		
17.0	Demonstrate an understanding of and be able to select and use energy and power technologies. – The student will be able to:		
	17.01 Discuss how energy cannot be created nor destroyed; however, it can be converted from one form to another.		
	17.02 Construct a power system having a source of energy, a process, and loads.		
18.0	Demonstrate an understanding of and be able to select and use information and communication technologies. – The student will be able to:		
	18.01 Classify information and communication systems that allow information to be transferred as human to human, human to machine, machine to human, or machine to machine.		
	18.02 Use information and communication systems to inform, persuade, entertain, control, manage, and educate.		
19.0	Demonstrate safe and appropriate use of tools, machines, and materials in electronics technology. – The student will be able to:		
	19.01 Select appropriate tools, procedures, and/or equipment.		
	19.02 Demonstrate the safe usage of appropriate tools, procedures, and operation of equipment.		
	19.03 Follow laboratory safety rules and procedures.		
	19.04 Demonstrate good housekeeping at workstation within total laboratory.		
	19.05 Identify color-coding safety standards.		
	19.06 Explain fire prevention and safety precautions and practices for extinguishing fires.		
	19.07 Identify harmful effects/potential dangers of familiar hazardous substances/devices to people and the environment.		
33.0	Perform advanced study and skills related to electronics. – The student will be able to:		
	33.01 Select an individual or group project in cooperation with the teacher.		
	33.02 Develop a written plan of work to carry out the project.		
	33.03 Show evidence of technical study in support of the project.		
	33.04 Perform skills related to the project.		
	33.05 Complete the project as planned.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
34.0	Demonstrate an understanding of the principles and applications of microcomputer systems. – The student will be able to:		
34.01	Define microcomputer systems.		
34.02	Describe the importance of microcomputer systems in today's technology world.		
34.03	Describe microcomputer applications in today's technology world.		
34.04	Define microcomputer interfacing.		
34.05	Conduct microcomputer systems experiments.		
34.06	Conduct microcomputer systems interfacing, sensing and control applications.		
35.0	Describe, identify, and correct problems in electronic circuits. – The student will be able to:		
35.01	Identify problems when dealing with power supplies, oscillators, and amplifiers.		
35.02	Demonstrate solutions to problems with power supplies, oscillators, and amplifiers.		
36.0	Demonstrate technical knowledge and skills about electronic networks and systems. – The student will be able to:		
36.01	Define and describe telecommunications.		
36.02	Conduct telecommunications experiments including receivers, transmitters, wirelines and antennas, telephones and fiber optics.		
36.03	Describe the technology and organization of electronic guidance systems.		
36.04	Perform technical skills in building, assembling, servicing, or operating one of the above systems.		
36.05	Define and describe logic control.		
36.06	Conduct a logic control experiment.		
36.07	Define and describe digital communications.		
36.08	Conduct a digital communications experiment.		
36.09	Define and describe industrial controls.		
36.10	Conduct an industrial controls experiment.		
37.0	Conduct a research and experimentation project on an electronic system or process. – The student will be able to:		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	37.01 Identify a problem.		
	37.02 State a need to research the problem.		
	37.03 Form a hypothesis about the problem.		
	37.04 Plan the procedures for researching the problem.		
	37.05 Conduct the research following the planned procedures.		
	37.06 Present the research findings in a seminar.		
	37.07 State conclusions based on the research findings.		
38.0	Demonstrate an understanding of career opportunities and requirements in the field of electronics technology. – The student will be able to:		
	38.01 Discuss individual interests related to a career in electronics technology.		
	38.02 Explore career opportunities related to a career in electronics technology.		
	38.03 Explore secondary education opportunities related to electronics technology.		
	38.04 Conduct a job search.		
	38.05 Complete a job application form correctly.		
	38.06 Demonstrate competence in job interview techniques.		
	38.07 Create a professional resume and letter of introduction.		
	38.08 Solicit awards, letters of recommendation and recognition.		
	38.09 Organize work samples in a professional, presentable format.		

Additional Information

Laboratory Activities

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

Career and Technical Student Organization (CTSO)

The Florida Technology Student Association (FL-TSA) is the intercurricular career and technical student organization for providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

Cooperative Training – OJT

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

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 Occupational Completion Point (OCP) or a Modified Occupational Completion Point (MOCP). If needed, a student may enroll in the same career and technical course more than once. Documentation should be included in the IEP that clearly indicates that it is anticipated that the student may need an additional year to complete an OCP/MOCP. The student should work on different competencies and new applications of competencies each year toward completion of the OCP/MOCP. After achieving the competencies identified for the year, the student earns credit for the course. It is important to ensure that credits earned by students are reported accurately. The district's information system must be designed to accept multiple credits for the same course number for eligible students with disabilities.

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

Florida Department of Education
Curriculum Framework

Program Title: **Communications Technology**
Program Type: **Non Career Preparatory**
Career Cluster: **Engineering & Technology Education**

Secondary – Non Career Preparatory	
Program Number	8601000
CIP Number	0821010600
Grade Level	9-12; 30, 31
Standard Length	3 credits
Teacher Certification	TEC ED 1 @2 PRINTING @7 7G GRAPH ARTS @4 COMM ART @7 7G
CTSO	Florida Technology Student Association (FL-TSA)
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 communications technology. 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. Communications Technology represents the current and expanding digital technology.

The content includes, but is not limited to a study of the processes, uses, and technical skills found in visual technologies (both conventional and digital procedures), multimedia production, computer animation and graphics, web page design, electronic media, and other new and emerging technologies.

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 one-credit courses. The following table illustrates the program structure:

Course Number	Course Title	Length	Level	Graduation Requirement
8601010	Communications Technology I	1 credit	3	PA
8601020	Communications Technology II	1 credit	3	PA
8601030	Communications Technology III	1 credit	3	PA

(Graduation Requirement Abbreviations- EQ= Equally Rigorous Science, PA= Practical Arts, EC= Economics, VO= Career and Technical Education)

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.

Academic Alignment Table

Academic alignment is an ongoing, collaborative effort of professional educators specializing in the fields of science, mathematics, English/language arts, and Career and Technical Education (CTE). This initiative supports CTE programs by improving student performance through the integration of academic content within CTE courses. Career and Technical Education courses that have been aligned to the Next Generation Sunshine State Standards for Science and the Florida Standards for Mathematics and English/Language Arts will show the following data: the quantity of academic standards in the CTE course; the total number of standards contained in the academic course; and the percentage of alignment to the CTE course.

Courses	Anatomy/ Physiology Honors	Astronomy Solar/Galactic Honors	Biology 1	Chemistry 1	Earth-Space Science	Environmental Science	Genetics	Integrated Science	Marine Science 1 Honors	Physical Science	Physics 1
8601010	**	**	**	**	**	**	**	**	**	**	**
8601020	**	**	**	**	**	**	**	**	**	**	**
8601030	**	**	**	**	**	**	**	**	**	**	**

** *Alignment pending review* # *Alignment attempted, but no correlation to academic course*

Courses	Algebra 1	Algebra 2	Geometry	English 1	English 2	English 3	English 4
8601010	**	**	**	**	**	**	**
8601020	**	**	**	**	**	**	**
8601030	**	**	**	**	**	**	**

** *Alignment pending review* # *Alignment attempted, but no correlation to academic course*

Florida Standards for Technical Subjects

Florida Standards (FS) for English Language Arts and Literacy in History/Social Studies, Science, and Technical Subjects are the critical reading and writing literacy standards designed for grade 6 and above. These standards are predicated on teachers of history/social studies, science, and technical subjects using their content area expertise to help students meet the particular challenges of reading, writing, speaking, listening, and language in their respective fields. It is important to note that the 6-12 literacy standards in history/social studies, science, and technical subjects are not meant to replace content standards in those areas but rather to supplement them.

This curriculum framework incorporates the grades 9-10 reading and writing literacy standards in the first two courses of this CTE program and grade 11-12 reading and writing literacy standards in the third and fourth courses of this CTE program. The standards for Mathematical Practices describe varieties of expertise that educators at all levels should seek to develop in their students. These practices rest on important "processes and proficiencies" with longstanding importance in mathematics education. This curriculum framework incorporates the appropriate mathematical practices in the first four courses of this CTE program.

Common Career Technical Core – Career Ready Practices

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

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

2. Apply appropriate academic and technical skills.

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

4. Communicate clearly, effectively and with reason.

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

6. Demonstrate creativity and innovation.

7. Employ valid and reliable research strategies.

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

9. Model integrity, ethical leadership and effective management.

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

11. Use technology to enhance productivity.

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

Standards

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

01.0 Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Communication Technology.
02.0 Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Communication Technology.
03.0 Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Communication Technology.
04.0 Demonstrate an understanding of the characteristics and scope of technology.
05.0 Demonstrate an understanding of the core concepts of technology.
06.0 Demonstrate an understanding of the relationships among technologies and the connection between technology and other fields of study.
07.0 Demonstrate an understanding of the influence of technology on history.
08.0 Demonstrate an understanding of the design process.
09.0 Demonstrate an understanding of and be able to select and use information and communication technologies.
10.0 Demonstrate safe and appropriate use of tools, machines, and materials in communications technology.
11.0 Demonstrate technical knowledge and skills in the area of product design.
12.0 Perform layout, design, and measurement activities associated with desktop publishing.
13.0 Express technical knowledge and understanding of major printing processes.
14.0 Identify computer components and their functions.
15.0 Demonstrate proficiency with common computer peripherals, including connections to standard input and output devices.
16.0 Demonstrate knowledge of computer file management.
17.0 Demonstrate proficiency using the Internet to locate information.
18.0 Demonstrate an understanding of Internet safety and ethics.
19.0 Develop and apply word processing and document manipulation skills.
20.0 Develop and apply fundamental spreadsheet skills.
21.0 Demonstrate an understanding of color theory and its role in communications design.
22.0 Demonstrate an understanding of the elements and principles of graphic design.
23.0 Demonstrate an understanding of typography.
24.0 Demonstrate basic proficiency in using digital photography and digital imaging.
25.0 Demonstrate proficiency in using a software application for digital imaging.
26.0 Develop an awareness of emerging technologies associated with communication design.
27.0 Demonstrate an understanding and application of the various approaches used in problem solving.
28.0 Demonstrate abilities to apply the design process.
29.0 Demonstrate safe and appropriate use of tools, machines, and materials in communications technology.
30.0 Demonstrate technical knowledge and skills in the area of design.
31.0 Demonstrate technical knowledge and skills in finishing, binding and packaging.
32.0 Demonstrate proficiency in using presentation software.
33.0 Define, design, and complete a desktop publishing project.
34.0 Demonstrate proficiency in using digital photography and digital imaging.
35.0 Demonstrate proficiency in manipulating two-dimensional images.

36.0 Demonstrate an understanding of kinetic typography.
37.0 Use computer networks, internet and online resources to facilitate collaborative communication.
38.0 Compare and contrast various forms of digital media delivery systems.
39.0 Plan, organize, and carry out a communications project plan.
40.0 Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Communication Technology.
41.0 Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Communication Technology.
42.0 Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Communication Technology.
43.0 Demonstrate an understanding of the cultural, social, economic, and political effects of technology.
44.0 Demonstrate the abilities to use and maintain technological products and systems.
45.0 Demonstrate proficiency in the design of communication solutions involving motion, rich media, or special effects.
46.0 Demonstrate proficiency in producing a communications product for delivery using mobile communication devices.
47.0 Demonstrate technical knowledge and skills in digital and electronic communication.
48.0 Demonstrate the abilities to assess the impact of products and systems.
49.0 Demonstrate an understanding of career opportunities and requirements in the field of communications technology.
50.0 Demonstrate an understanding of the use of emerging technologies in communication and advertising.
51.0 Plan, organize, and carry out project plans for creating various communications products.

Florida Department of Education
Student Performance Standards

Course Title: **Communications Technology I**
Course Number: **8601010**
Course Credit: **1**

Course Description:
This course provides students with instruction in the characteristics and evolution of technology, underlying principles of design, and fundamental knowledge and skills in the use of software used in communications design. Included in the content is the use of essential application software. The ultimate output of this course is a design portfolio created by the student. Each item or product included in the portfolio should include a narrative description and an explanation of the technical approach or techniques used to create the item. Consideration should be given to having students present the portfolio using presentation software.

Florida Standards			Correlation to CTE Program Standard #
01.0	Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Communication Technology.		
	01.01 Key Ideas and Details		
	01.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. LAFS.910.RST.1.1	
	01.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.910.RST.1.2	
	01.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.910.RST.1.3	
	01.02 Craft and Structure		
	01.02.1	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. LAFS.910.RST.2.4	
	01.02.2	Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). LAFS.910.RST.2.5	

Florida Standards			Correlation to CTE Program Standard #
	01.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. LAFS.910.RST.2.6	
01.03	Integration of Knowledge and Ideas		
	01.03.1	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. LAFS.910.RST.3.7	
	01.03.2	Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. LAFS.910.RST.3.8	
	01.03.3	Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. LAFS.910.RST.3.9	
01.04	Range of Reading and Level of Text Complexity		
	01.04.1	By the end of grade 9, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	01.04.2	By the end of grade 10, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 9–10 text complexity band independently and proficiently. LAFS.910.RST.4.10	
02.0	Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Communication Technology.		
02.01	Text Types and Purposes		
	02.01.1	Write arguments focused on discipline-specific content. LAFS.910.WHST.1.1	
	02.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.910.WHST.1.2	
02.02	Production and Distribution of Writing		
	02.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.910.WHST.2.4	

Florida Standards			Correlation to CTE Program Standard #
	02.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.910.WHST.2.5	
	02.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. LAFS.910.WHST.2.6	
	02.03	Research to Build and Present Knowledge	
	02.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.910.WHST.3.7	
	02.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. LAFS.910.WHST.3.8	
	02.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.910.WHST.3.9	
	02.04	Range of Writing	
	02.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.910.WHST.4.10	
03.0	Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Communication Technology.		
	03.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	
	03.02	Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
	03.03	Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	

Florida Standards	Correlation to CTE Program Standard #
03.04 Model with mathematics. MAFS.K12.MP.4.1	
03.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
03.06 Attend to precision. MAFS.K12.MP.6.1	
03.07 Look for and make use of structure. MAFS.K12.MP.7.1	
03.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
04.0 Demonstrate an understanding of the characteristics and scope of technology. – The student will be able to:		
04.01 Discuss the nature and development of technological knowledge and processes.		
04.02 Explain the rapid increase in the rate of technological development and diffusion.		
04.03 Conduct specific, goal-directed research related to inventions and innovations.		
05.0 Demonstrate an understanding of the core concepts of technology. – The student will be able to:		
05.01 Explain systems thinking and the relationship between logic, creativity, and compromise in solving complex problems.		
05.02 Describe technological systems and their role within larger technological, social, and environmental systems.		
05.03 Identify the stability of a technological system and its influence by all of the components in the system, especially those in the feedback loop.		
05.04 Describe the trade-offs between competing values (e.g., availability, cost, desirability, waste, et al) in the selection of resources.		
05.05 Describe the criteria and constraints of a solution and how they affect the final result.		
05.06 Describe management and associated dynamics as they relate to technological development.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
06.0	Demonstrate an understanding of the relationships among technologies and the connection between technology and other fields of study. – The student will be able to:		
06.01	Identify technology transfer occurring when a new user applies an existing innovation developed for one purpose in a different function.		
06.02	Identify technological innovation resulting when ideas, knowledge, or skills are shared within a technology, among technologies, or across other fields.		
06.03	Outline the process of patenting to protect a technological idea.		
06.04	Identify technological progresses that promote the advancement of science and mathematics.		
07.0	Demonstrate an understanding of the influence of technology on history. – The student will be able to:		
07.01	Describe how most technological development has been evolutionary, the result of a series of refinements to a basic invention.		
07.02	Relate the advancement of technology to the evolution of civilization.		
07.03	Describe ways in which technology helps to shape social, cultural, political, and economic aspects of society.		
07.04	Describe the major technological developments that characterized the Industrial Revolution and their impact on society.		
07.05	Describe the major technological developments that characterized the Information Age and their impact on society.		
08.0	Demonstrate an understanding of the design process. – The student will be able to:		
08.01	Describe the implication of audience, purpose/message and timeframe constraints of a project.		
08.02	Describe the sequence of steps and associated activities involved in applying the design process.		
08.03	Compare and contrast creative and analytic problem-solving strategies to the design process.		
08.04	Discuss why the design process must begin with a clearly stated problem.		
08.05	Explain the relationship between design criteria and design constraints.		
08.06	Explain the forms of analysis used in evaluating potential solutions, particularly those forms associated with design principles, estimation, economics, and worst case scenario.		
08.07	Brainstorm potential solutions to a communication design problem.		
08.08	Describe a decision table and how it is used to evaluate proposed solutions to communications design problem.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	08.09 Produce thumbnail sketches/rough design and final designs.		
	08.10 Identify the factors that ensure the sustainability and effectiveness of a communications design (e.g., visual appeal, audience, media, market research).		
09.0	Demonstrate an understanding of and be able to select and use information and communication technologies. – The student will be able to:		
	09.01 Describe and give examples of the essential elements of a communication system (i.e., inputs, processes, and outputs).		
	09.02 Describe and give examples of human to human, human to machine, machine to human, and machine to machine communications.		
	09.03 Select and use information and communication systems to inform, persuade, entertain, control, manage, and educate.		
	09.04 Identify components of a communication system, including source, encoder, transmitter, receiver, decoder, storage, retrieval, and destination.		
	09.05 Compare and contrast the means of communicating visual messages (i.e., graphically, electronically) and associated forms (e.g., digital, analog, and multimedia).		
	09.06 Compare and contrast the forms for communicating technological information (e.g., symbols, icons, graphic, measurement, et al).		
10.0	Demonstrate safe and appropriate use of tools, machines, and materials in communications technology. – The student will be able to:		
	10.01 Select appropriate tools, procedures, and/or equipment.		
	10.02 Demonstrate the safe usage of appropriate tools, procedures, and operation of equipment.		
	10.03 Follow laboratory safety rules and procedures.		
	10.04 Demonstrate good housekeeping at workstation within total laboratory.		
	10.05 Identify color-coding safety standards.		
	10.06 Explain fire prevention and safety precautions and appropriate practices for extinguishing fires.		
	10.07 Identify harmful effects/potential dangers of familiar hazardous substances/devices to people and the environment.		
11.0	Demonstrate technical knowledge and skills in the area of product design. – The student will be able to:		
	11.01 Demonstrate an understanding of the elements and principles of design of a communications product (e.g., media, venue, language, message, interactivity),		
	11.02 Compare and contrast basic types of layouts.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
11.03	Describe the activities and implications of content preparation and editing/proofreading.		
11.04	Develop specifications for a particular job.		
12.0	Perform layout, design, and measurement activities associated with desktop publishing. – The student will be able to:		
12.01	Demonstrate basic technical skills using a desktop publishing application (e.g., Quark, InDesign, Microsoft Publisher)		
12.02	Understand the differences between manual paste-up and electronic page layout.		
12.03	Identify distinct elements in a layout.		
12.04	Demonstrate familiarity with terms associated with desktop publishing (e.g., leading, kerning, tracking, baseline shift, ligature, line spacing),		
12.05	Identify characteristics of type, type families, type series, and type styles.		
12.06	Install and apply fonts.		
12.07	Compare and contrast methods of measurement used in desktop publishing (e.g., in, cm, mm, points, picas)		
12.08	Produce a variety of designs using desktop publishing software, including multi-panel and those using master pages.		
12.09	Incorporate clip art/images, borders, and other special effects into a DTP design.		
12.10	Understand and comply with the legalities of using preexisting images (copyright/trademark).		
12.11	Describe page imposition and its impact on document design.		
12.12	Create various print and digital publications (e.g., business cards, letterheads, flyers, brochures, newsletters, posters, programs and calendars).		
13.0	Express technical knowledge and understanding of major printing processes. – The student will be able to:		
13.01	Explain and demonstrate pre-press operations.		
13.02	Demonstrate an understanding of printing processes (i.e., letterpress, gravure, screen, lithographic).		
13.03	Demonstrate an understanding of digital printing processes (e.g., dye sublimation, direct print, laser jet).		
13.04	Demonstrate an understanding of the process of projection printing.		
13.05	Demonstrate an understanding of the lithographic offset press process.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	13.06 Explain the difference between printing and duplicating processes.		
	13.07 Design and layout copy for single-color printing project.		
	13.08 Produce a printing project.		
14.0	Identify computer components and their functions. – The student will be able to:		
	14.01 Identify the internal components of a computer (e.g., power supply, hard drive, mother board, I/O cards/ports, cabling, etc.).		
	14.02 Identify various computer input devices (e.g., mouse, keyboard, phone, camera) and describe their use.		
	14.03 Identify various computer output devices (e.g., monitor, printer, phone) and describe their use.		
	14.04 Identify various storage devices (e.g., flash drive, iPod, phone, external hard drive, etc.)		
15.0	Demonstrate proficiency with common computer peripherals, including connections to standard input and output devices. – The student will be able to:		
	15.01 Identify and demonstrate the types and functions of common input devices (e.g., mouse, keyboard, camera, microphone, scanner).		
	15.02 Identify the types and functions of specialized input devices (e.g., digital cameras, mobile devices, GPS devices).		
	15.03 Describe the types and purposes of various computer connection ports (e.g., USB, firewire, parallel, serial, Ethernet, et al).		
	15.04 Connect an input device (e.g., mouse, keyboard, cell phone, camera, et al) and verify proper operation.		
	15.05 Connect an output device (e.g., printer, monitor, projector, et al) and verify proper operation.		
16.0	Demonstrate knowledge of computer file management. – The student will be able to:		
	16.01 Describe and use conventional file naming conventions.		
	16.02 Demonstrate proficiency with file management tasks (e.g., folder creation, file creation, backup, copy, delete, open, save).		
	16.03 Be able to identify file types by extension (e.g., .doc, .txt, .wav, xls, etc.).		
17.0	Demonstrate proficiency using the Internet to locate information. – The student will be able to:		
	17.01 Identify and use web terminology.		
	17.02 Define Universal Resource Locators (URLs) and associated protocols (e.g., http, ftp, telnet, mailto).		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
17.03	Compare and contrast the types of Internet domains (e.g., .com, .org, .edu, .gov, .net, .mil).		
17.04	Demonstrate proficiency using search engines, including Boolean search techniques.		
17.05	Apply the rules for properly citing works or other information obtained from the Internet.		
17.06	Identify and apply Copyright Fair Use guidelines.		
17.07	Evaluate online information for credibility and quality using basic guidelines and indicators (e.g. authority, affiliation, purpose, etc.).		
18.0	Demonstrate an understanding of Internet safety and ethics. – The student will be able to:		
18.01	Describe cyber-bullying and its impact on perpetrators and victims.		
18.02	Differentiate between viruses and malware, specifically their sources, ploys, and impact on personal privacy and computer operation, and ways to avoid infection.		
18.03	Demonstrate proficiency running an antivirus scan to remove viruses and malware.		
18.04	Describe risks associated with social networking sites (e.g., FaceBook, MySpace, and Twitter) and ways to mitigate these risks.		
18.05	Adhere to cyber safety practices with regard to conducting Internet searches, email, chat rooms, and other social network websites.		
18.06	Adhere to Acceptable Use Policies when accessing the Internet.		
19.0	Develop and apply word processing and document manipulation skills. – The student will be able to:		
19.01	Apply and adjust margins, tabs, line spacing and paragraph indents.		
19.02	Insert and manipulate text, graphics/images, and WordArt.		
19.03	Format text using the font interface and styles interface.		
19.04	Adjust the size, position, and layout wrapping settings of a graphic/image.		
19.05	Use the status bar to determine the number of pages, words, and characters in a document.		
19.06	Insert codes for current date and time.		
19.07	Copy text between documents using mouse, menu, and keyboard techniques.		
19.08	Move text in a document using mouse, menu, and keyboard techniques.		
19.09	Create bulleted and numbered lists.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
19.10 Create a table – Inserting, moving and entering data.		
19.11 Create a table – format rows, columns and cells.		
19.12 Insert page breaks.		
19.13 Adjust magnification of document display single and multiple pages.		
19.14 Understand printing options including shrink to fit, gutters, and document orientation.		
19.15 Create a report or essay that contains a title page, text, a graphic/image, and WordArt.		
20.0 Develop and apply fundamental spreadsheet skills. – The student will be able to:		
20.01 Describe a spreadsheet and the ways in which it may be used.		
20.02 Identify the parts of the spreadsheet display.		
20.03 Insert and format text information into cells.		
20.04 Insert and format numeric information into cells.		
20.05 Insert and format date and time information into cells.		
20.06 Select multiple cells using the mouse.		
20.07 Copy information from one or more cells to another part of the spreadsheet.		
20.08 Move information from one or more cells to another part of the spreadsheet.		
20.09 Sum the numeric values of multiple cells.		
20.10 Use the sort function to alphabetize a table of information.		
20.11 Create and navigate through a worksheet.		
20.12 Change column width and row height.		
20.13 Insert columns and rows.		
20.14 Merge cells.		
20.15 Use Undo and Redo features.		
20.16 Insert arithmetic formulas into a spreadsheet.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	20.17 Create and print a table that displays and sums the quantities or values of different categories of data.		
	20.18 Create a chart based on data sets defined in a spreadsheet.		
	20.19 Adjust chart types to appropriately represent base data.		
21.0	Demonstrate an understanding of color theory and its role in communications design. – The student will be able to:		
	21.01 Describe the spectral colors in the visible light spectrum.		
	21.02 Describe the difference between color and light.		
	21.03 Differentiate between spectral and primary colors.		
	21.04 Describe the difference between additive and subtractive color mixing.		
	21.05 Compare and contrast the RGB and CYMK color models as used in communication design.		
	21.06 Demonstrate knowledge in terms relating to color such as chroma, lightness, saturation, hue, intensity, luminance/value, shade, tint, etc.		
	21.07 Demonstrate an understanding relating to the meanings of color (the psychology of color & the application of color in design).		
	21.08 Demonstrate a working knowledge and technical skills relating to Application of color theory to design practices.		
22.0	Demonstrate an understanding of the elements and principles of graphic design. – The student will be able to:		
	22.01 Describe the elements of graphic design (e.g., line, shape, mass, texture, color, lighting).		
	22.02 Describe the principles of graphic design (e.g., balance, unity, contrast, rhythm, proportion, scaling).		
	22.03 Apply the elements and principles of design to enhance the message of the image/text and layout.		
	22.04 Distinguish between criteria and constraints for a given communication design problem.		
23.0	Demonstrate an understanding of typography. – The student will be able to:		
	23.01 Describe character and line spacing and their role in enhancing readability, legibility, and emphasis.		
	23.02 Identify characteristics of type, type families, type series, and type styles		
	23.03 Demonstrate an understanding of the history of typography		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	23.04 Describe the principles of typographic design as they relate to communication design.		
	23.05 Compare and contrast the techniques for typographic communication relative to their appropriateness and effectiveness.		
	23.06 Demonstrate proficiency in incorporating typographic techniques into a communication design.		
24.0	Demonstrate basic proficiency in using digital photography and digital imaging. – The student will be able to:		
	24.01 Demonstrate typical features and operation of a digital camera.		
	24.02 Demonstrate knowledge of ethics related to digital imaging, as well as legal and consent issues.		
	24.03 Apply effective design principles in digital photography compositions.		
	24.04 Illustrate the essence of an event, quote, or slogan through digital photography/imaging.		
	24.05 Incorporate scanned or digitally taken photographs into documents comprising a communication design (e.g., poster, brochure, card, advertisement, web).		
25.0	Demonstrate proficiency in using a software application for digital imaging. – The student will be able to:		
	25.01 Differentiate between bitmap/raster and vector graphic images.		
	25.02 Demonstrate a basic knowledge of the tools and techniques for using vector software application (e.g., Illustrator)		
	25.03 Create various illustrations using vector software.		
	25.04 Demonstrate a basic knowledge of the tools and techniques for using a bitmap/raster software application (e.g., Photoshop)		
	25.05 Create and edit images/photographs using digital imaging software (e.g. Photoshop).		
	25.06 Demonstrate skill in image manipulation, color correction, and special effects to creatively convey a message.		
	25.07 Demonstrate skill in scanning and cropping photographs.		
	25.08 Compare and contrast image formats (e.g., TIF, BMP, EPS, JPEG, GIF, Raw).		
	25.09 Demonstrate an understanding of image resolution and compression factors such as transmission speed, color reduction, and delivery media parameters.		
26.0	Develop an awareness of emerging technologies associated with communication design. – The student will be able to:		
	26.01 Compare and contrast emerging technologies relative to their role in communication design (e.g., wireless, wireless web, cell phones, portables, handhelds, kiosks).		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
26.02	Describe social media as an emerging communications technology.		
26.03	Describe the emerging or evolving nature of software applications used in communication design (e.g., Adobe InDesign).		
26.04	Explain how the use of advanced image sensing devices have altered the manner in which communication takes place, especially those employing Quick Response (QR) codes or other form of two-dimensional bar coding technologies.		

Florida Department of Education
Student Performance Standards

Course Title: **Communications Technology II**
Course Number: **8601020**
Course Credit: **1**

Course Description:
In this course, students learn more about the nature of design and development techniques for communication purposes. Students are also provided with instruction in a variety of technologies commonly used to communicate concepts and designs. Students are expected to continue collating their portfolio using exemplars of their work. As with previous portfolio pieces, each exemplar should include a narrative description of the item with an explanation of any special techniques used to create the item.

Florida Standards			Correlation to CTE Program Standard #
01.0	Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Communication Technology.		
	01.01 Key Ideas and Details		
	01.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. LAFS.910.RST.1.1	
	01.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.910.RST.1.2	
	01.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.910.RST.1.3	
	01.02 Craft and Structure		
	01.02.1	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. LAFS.910.RST.2.4	
	01.02.2	Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). LAFS.910.RST.2.5	

Florida Standards			Correlation to CTE Program Standard #
	01.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. LAFS.910.RST.2.6	
01.03	Integration of Knowledge and Ideas		
	01.03.1	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. LAFS.910.RST.3.7	
	01.03.2	Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. LAFS.910.RST.3.8	
	01.03.3	Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. LAFS.910.RST.3.9	
01.04	Range of Reading and Level of Text Complexity		
	01.04.1	By the end of grade 9, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	01.04.2	By the end of grade 10, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 9–10 text complexity band independently and proficiently. LAFS.910.RST.4.10	
02.0	Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Communication Technology.		
02.01	Text Types and Purposes		
	02.01.1	Write arguments focused on discipline-specific content. LAFS.910.WHST.1.1	
	02.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.910.WHST.1.2	
02.02	Production and Distribution of Writing		
	02.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.910.WHST.2.4	

Florida Standards			Correlation to CTE Program Standard #
	02.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.910.WHST.2.5	
	02.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. LAFS.910.WHST.2.6	
	02.03	Research to Build and Present Knowledge	
	02.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.910.WHST.3.7	
	02.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. LAFS.910.WHST.3.8	
	02.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.910.WHST.3.9	
	02.04	Range of Writing	
	02.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.910.WHST.4.10	
03.0	Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Communication Technology.		
	03.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	
	03.02	Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
	03.03	Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	

Florida Standards	Correlation to CTE Program Standard #
03.04 Model with mathematics. MAFS.K12.MP.4.1	
03.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
03.06 Attend to precision. MAFS.K12.MP.6.1	
03.07 Look for and make use of structure. MAFS.K12.MP.7.1	
03.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
27.0 Demonstrate an understanding and application of the various approaches used in problem solving. – The student will be able to:		
27.01 Employ research and development processes to assess the functional, economic, and ethical viability of a product or prototype.		
27.02 Research a problem and determine the most appropriate problem-solving method to employ.		
27.03 Determine whether the solution to a specific problem is technology-based.		
27.04 Utilize a multidisciplinary approach to solving technological problems.		
28.0 Demonstrate abilities to apply the design process. – The student will be able to:		
28.01 Determine whether a communications design problem is worthy of being resolved or addressed.		
28.02 Identify the criteria and constraints associated with a communications design problem and select the most appropriate solution based on these factors.		
28.03 Evaluate the quality, efficiency, and productivity of an existing or proposed design and refine the design accordingly.		
28.04 Evaluate an existing design using conceptual, physical, and mathematical models and note aspects for improvement.		
28.05 Select an appropriate brainstorming process (e.g., concept mapping, graphic organizers and explain its role in the design process.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	28.06 Design and develop communications design solution using the design process.		
	28.07 Create and deliver a slide presentation to communicate the design process, design decision methodology, design criteria and constraints, and final solution to a communications design problem.		
29.0	Demonstrate safe and appropriate use of tools, machines, and materials in communications technology. – The student will be able to:		
	29.01 Select appropriate tools, procedures, and/or equipment needed to produce a product.		
	29.02 Demonstrate the safe usage of appropriate tools, procedures, and operation of equipment needed to manufacture a product.		
	29.03 Follow laboratory safety rules and procedures.		
	29.04 Demonstrate good housekeeping at workstation within total laboratory.		
	29.05 Identify color-coding safety standards.		
	29.06 Explain fire prevention and safety precautions and appropriate practices for extinguishing fires.		
	29.07 Identify harmful effects/potential dangers of familiar hazardous substances/devices to people and the environment.		
30.0	Demonstrate technical knowledge and skills in the area of design. – The student will be able to:		
	30.01 Demonstrate how to represent type and graphic elements in a rough layout.		
	30.02 Describe the effects of various printing technologies on the design.		
	30.03 Describe how a project's purpose, mood and audience affect the design.		
	30.04 Demonstrate organizational structures in layout and design.		
31.0	Demonstrate technical knowledge and skills in finishing, binding and packaging. – The student will be able to:		
	31.01 Describe standard binding, finishing and packaging processes.		
	31.02 Demonstrate the proper and safe use of binding, finishing, and packaging equipment.		
	31.03 Describe the processes of imposition, pagination, scoring, folding, gathering, and collating.		
	31.04 Finish and bind a printed product using the proper technical skills.		
	31.05 Demonstrate proper packaging for a printed project.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
32.0	Demonstrate proficiency in using presentation software. – The student will be able to:		
32.01	Describe presentation software and the ways in which it may be used.		
32.02	Create a Slide Master.		
32.03	Adjust presentation format using the Slide Master.		
32.04	Add and format titles, subtitles, and talking points to a presentation slide.		
32.05	Insert date and time codes and slide numbers to slides.		
32.06	Insert and format images/graphics onto slides.		
32.07	Insert new or duplicate slides.		
32.08	Adjust slide transition to include animation.		
32.09	Insert and adjust sound settings and timing in presentation.		
32.10	Adjust the sequence of slides in the presentation.		
32.11	Produce a presentation that includes text, graphics, and digital images and present it using a projection system.		
32.12	Adjust Slide Show Set-up to loop show continuously.		
33.0	Define, design, and complete a desktop publishing project. – The student will be able to:		
33.01	Use communication, analysis, and design skills to define project specifications that will meet client needs/desires.		
33.02	Create a project plan to account for time and resources to complete the project.		
33.03	Complete the project according to plan.		
33.04	Create a portfolio to showcase the project.		
34.0	Demonstrate proficiency in using digital photography and digital imaging. – The student will be able to:		
34.01	Demonstrate proficiency in adjusting the hardware features of a basic digital SLR camera, including manual settings, shutter speed, f-stops, et al,		
34.02	Demonstrate an understanding of lighting in photographic composition.		
34.03	Use imaging techniques (e.g., High Dynamic Range (HDR), panoramic, long exposure, stop motion, time lapse) to achieve different artistic effects.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
34.04	Demonstrate proficiency in photojournalism by creating a photo essay, magazine spread, book cover, video, or slideshow, et al.		
34.05	Demonstrate effective presentation (mounting, display, etc.) of a thematic photograph or video portfolio.		
35.0	Demonstrate proficiency in manipulating two-dimensional images. – The student will be able to:		
35.01	Demonstrate proficiency using selections and measurements.		
35.02	Transform images using scale, skew, distortion, rotation, and flip features.		
35.03	Adjust images using arrange, group, and flatten functions.		
35.04	Convert images to symbols.		
35.05	Create hotspots and slices.		
35.06	Use gradients and color channels to alter/adjust images.		
35.07	Use retouch and blend functions on images.		
35.08	Use patterns, textures, brushes, filters, masks, and transparency functions to create special effects.		
36.0	Demonstrate an understanding of kinetic typography. – The student will be able to:		
36.01	Describe the principles of kinetic typography as they relate to communication design.		
36.02	Compare and contrast scrolling, dynamic, and fluid typographic layouts relative to their appropriateness and effectiveness.		
36.03	Demonstrate proficiency in incorporating kinetic typography into a communication design.		
37.0	Use computer networks, internet and online resources to facilitate collaborative communication. – The student will be able to		
37.01	Demonstrate how to connect to an online collaborative resource.		
37.02	Discuss the ethics and copyright legalities of downloading or sharing music or videos from online collaborative environments (e.g., GoogleDocs).		
37.03	Describe risks associated with using social networking sites (e.g., FaceBook, MySpace, and Twitter) for collaboration and ways to mitigate these risks.		
37.04	Adhere to cyber safety practices with regard to conducting Internet searches, email, chat rooms, and other social network websites.		
37.05	Use various web tools associated with online collaboration, including those used downloading files, transfer of files, telnet, FTP, PDF, plug-ins, and data compression.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	37.06 Describe how communication is supported by interactive web applications, including real-time sharing of photos and video clips, messaging, chatting and collaborating.		
	37.07 Describe appropriate use of social networking sites and applications, blogs and collaborative tools for information, images, etc.		
38.0	Compare and contrast various forms of digital media delivery systems. – The student will be able to:		
	38.01 Explain the benefits and constraints of fixed versus streaming digital media.		
	38.02 Describe the variations in design considerations between mass display and on-demand display of digital media.		
	38.03 Discuss the variations in design considerations related to digital signage.		
	38.04 Describe the implications to the design of digital images and/or graphics based on projected mobile and WiFi delivery media.		
39.0	Plan, organize, and carry out a communications project plan. – The student will be able to:		
	39.01 Apply the design process to determine the scope of a project.		
	39.02 Organize the team according to individual strengths.		
	39.03 Assign specific tasks within a team.		
	39.04 Determine project priorities and timeline.		
	39.05 Identify required resources.		
	39.06 Plan research, design, development, and evaluation activities as required.		
	39.07 Carry out the project plan to successful completion.		
	39.08 Create a presentation to articulate the problem, the solution, the process chosen, conclusions, and lessons learned.		

Florida Department of Education
Student Performance Standards

Course Title: **Communications Technology III**
Course Number: **8601030**
Course Credit: **1**

Course Description:
In addition to exploring the implications of applying technologies, this course provides students with instruction in advanced techniques relative to both static and animated communication designs. In addition to learning more advanced techniques and emerging technologies, students will have an opportunity to research a project, design an appropriate solution, and present their results. The ultimate output of this course is the student's presentation of a completed portfolio illustrating their best exemplars. The portfolio should include a narrative description of the scenario, the approach to data collection, resulting renderings, and an interpretation of each chart/graph. Research references should be cited appropriately. Given the advanced nature of this course, students should be encouraged to produce the portfolio using presentation software suitable for dissemination via the Internet.

Florida Standards			Correlation to CTE Program Standard #
40.0	Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Communication Technology.		
	40.01 Key Ideas and Details		
	40.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. LAFS.1112.RST.1.1	
	40.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.1112.RST.1.2	
	40.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.1112.RST.1.3	
	40.02 Craft and Structure		
	40.02.1	Determine the meaning of symbols key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. LAFS.1112.RST.2.4	
	40.02.2	Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. LAFS.1112.RST.2.5	

Florida Standards			Correlation to CTE Program Standard #
	40.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. LAFS.1112.RST.2.6	
40.03	Integration of Knowledge and Ideas		
	40.03.1	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g. quantitative data, video, multimedia) in order to address a question or solve a problem. LAFS.1112.RST.3.7	
	40.03.2	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. LAFS.1112.RST.3.8	
	40.03.3	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. LAFS.1112.RST.3.9	
40.04	Range of Reading and Level of Text Complexity		
	40.04.1	By the end of grade 11, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	40.04.2	By the end of grade 12, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 11–CCR text complexity band independently and proficiently. LAFS.1112.RST.4.10	
41.0	Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Communication Technology.		
41.01	Text Types and Purposes		
	41.01.1	Write arguments focused on discipline-specific content. LAFS.1112.WHST.1.1	
	41.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.1112.WHST.1.2	
41.02	Production and Distribution of Writing		
	41.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.1112.WHST.2.4	

Florida Standards			Correlation to CTE Program Standard #
	41.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.1112.WHST.2.5	
	41.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. LAFS.1112.WHST.2.6	
	41.03	Research to Build and Present Knowledge	
	41.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.1112.WHST.3.7	
	41.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. LAFS.1112.WHST.3.8	
	41.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.1112.WHST.3.9	
	41.04	Range of Writing	
	41.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.1112.WHST.4.10	
42.0	Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Communication Technology.		
	42.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	
	42.02	Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
	42.03	Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	

Florida Standards	Correlation to CTE Program Standard #
42.04 Model with mathematics. MAFS.K12.MP.4.1	
42.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
42.06 Attend to precision. MAFS.K12.MP.6.1	
42.07 Look for and make use of structure. MAFS.K12.MP.7.1	
42.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
43.0 Demonstrate an understanding of the cultural, social, economic, and political effects of technology. – The student will be able to:		
43.01 Identify changes caused by the use of technology ranging from gradual to rapid and from subtle to obvious.		
43.02 Classify the use of technology involving weighing the trade-offs between the positive and negative effects.		
44.0 Demonstrate the abilities to use and maintain technological products and systems. – The student will be able to:		
44.01 Document processes and procedures and communicate them to different audiences using appropriate oral and written techniques.		
44.02 Diagnose a system that is malfunctioning and use tools, materials, machines, and knowledge to repair it.		
44.03 Troubleshoot, analyze, and maintain systems to ensure safe and proper function and precision.		
44.04 Operate systems so that they function in the way they were designed.		
44.05 Use computers and calculators to access, retrieve, organize, process, maintain, interpret, and evaluate data and information in order to communicate.		
45.0 Demonstrate proficiency in the design of communication solutions involving motion, rich media, or special effects. – The student will be able to:		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
45.01	Design a communication solution that employs animation or motion (e.g., graphics, text, video) to achieve or enhance the intended message.		
45.02	Demonstrate proficiency in the use of digital authoring and editing software (e.g., Flash, After Effects) to create a product featuring special visual effects.		
45.03	Design and create an interactive communication product featuring the use of rich media.		
45.04	Describe the design constraints associated with optics and devices (e.g., tablet, kiosk, smart phone) used in delivering communication products, especially as they relate to the incorporation of audio.		
46.0	Demonstrate proficiency in producing a communications product for delivery using mobile communication devices. – The student will be able to:		
46.01	Design and create a communication product suitable for delivery via multiple media (e.g., smart phones, tablets, laptop).		
46.02	Discuss the design implications of products intended for delivery via Bluetooth enabled devices.		
46.03	Compare and contrast the security and privacy issues associated with different delivery media, particularly those involving social media.		
47.0	Demonstrate technical knowledge and skills in digital and electronic communication. – The student will be able to:		
47.01	Demonstrate effective use of the internet to locate and evaluate information.		
47.02	Distribute information electronically.		
47.03	Identify effective design methods for presenting information digitally.		
47.04	Explain the history of electronic media and its role in the mass media and society.		
47.05	Demonstrate key roles in each stage of the production process.		
47.06	Organize a set for an electronic media production.		
47.07	Demonstrate ability to select appropriate media topics, equipment, and materials for an electronic media production.		
47.08	Identify and write different types of script copy.		
47.09	Produce an electronic media project.		
48.0	Demonstrate the abilities to assess the impact of products and systems. – The student will be able to:		
48.01	Collect information and evaluate its quality.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	48.02 Evaluate data, analyze trends, and draw conclusions regarding the effect of technology on the individual, society, and environment.		
	48.03 Use assessment techniques, such as trend analysis and experimentation to make decisions about the future development of technology.		
	48.04 Identify forecasting techniques to evaluate the results of altering natural systems.		
49.0	Demonstrate an understanding of career opportunities and requirements in the field of communications technology. – The student will be able to:		
	49.01 Discuss individual interests related to a career in communications technology.		
	49.02 Explore career opportunities related to a career in communications technology.		
	49.03 Explore secondary education opportunities related to communications technology.		
	49.04 Conduct a job search.		
	49.05 Complete a job application form correctly.		
	49.06 Demonstrate competence in job interview techniques.		
	49.07 Create a professional resume and letter of introduction.		
	49.08 Solicit awards, letters of recommendation and recognition.		
	49.09 Organize work samples in a professional, presentable format.		
50.0	Demonstrate an understanding of the use of emerging technologies in communication and advertising. – The student will be able to:		
	50.01 Describe photonics and its role in designing solutions to communications problems.		
	50.02 Demonstrate an understanding of the principles of optics and how they relate to communications technology.		
	50.03 Describe basic theories of wavelength, light and optics used in a variety of industries using lasers, including: manufacturing, engineering, telecommunications, entertainment, medicine, construction, and art.		
	50.04 Discuss modern trends in digital signage and imprinted advertising specialties.		
	50.05 Explain the various technologies associated with these industries.		
	50.06 Compare and contrast imprinted and dye sublimation transfer processes.		
51.0	Plan, organize, and carry out project plans for creating various communications products. – The student will be able to:		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
51.01	Apply the design process to determine the goal, scope, criteria, constraints, and timeline of the project.		
51.02	Work as part of the project team, supporting project focus, direction, and progress.		
51.03	Identify required resources.		
51.04	Plan research, design, development, and evaluation activities as required.		
51.05	Carry out the project plan to successful completion.		
51.06	Create a presentation to articulate the problem, the solution, the process chosen, conclusions, and lessons learned.		

Additional Information

Laboratory Activities

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

Career and Technical Student Organization (CTSO)

The Florida Technology Student Association (FL-TSA) is the intercurricular career and technical student organization for providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

Cooperative Training – OJT

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

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 Occupational Completion Point (OCP) or a Modified Occupational Completion Point (MOCP). If needed, a student may enroll in the same career and technical course more than once. Documentation should be included in the IEP that clearly indicates that it is anticipated that the student may need an additional year to complete an OCP/MOCP. The student should work on different competencies and new applications of competencies each year toward completion of the OCP/MOCP. After achieving the competencies identified for the year, the student earns credit for the course. It is important to ensure that credits earned by students are reported accurately. The district's information system must be designed to accept multiple credits for the same course number for eligible students with disabilities.

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

Florida Department of Education
Curriculum Framework

Program Title: **Materials and Processes Technology**
Program Type: **Non Career Preparatory**
Career Cluster: **Engineering & Technology Education**

Secondary – Non Career Preparatory	
Program Number	8601100
CIP Number	0821010700
Grade Level	9-12; 30, 31
Standard Length	3 credits
Teacher Certification	TEC ED 1 @2 ENG @7 7G WOODWORK @4 CAB WOODWK @7 7G
CTSO	Florida Technology Student Association (FL-TSA)
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 the technology of materials and processes. 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, a study of the pre-processing, processing, and post-processing of wood, metal, plastic, composites, and other materials. The content and activities will also include the study of entrepreneurship, safety, and leadership skills.

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

Program Structure

This program is a planned sequence of instruction consisting of three one-credit courses. The following table illustrates the program structure:

Course Number	Course Title	Length	Level	Graduation Requirement
8601110	Materials and Processes Technology I	1 credit	2	PA
8601120	Materials and Processes Technology II	1 credit	2	PA
8601130	Materials and Processes Technology III	1 credit	3	PA

(Graduation Requirement Abbreviations- EQ= Equally Rigorous Science, PA= Practical Arts, EC= Economics, VO= Career and Technical Education)

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.

Academic Alignment Table

Academic alignment is an ongoing, collaborative effort of professional educators specializing in the fields of science, mathematics, English/language arts, and Career and Technical Education (CTE). This initiative supports CTE programs by improving student performance through the integration of academic content within CTE courses. Career and Technical Education courses that have been aligned to the Next Generation Sunshine State Standards for Science and the Florida Standards for Mathematics and English/Language Arts will show the following data: the quantity of academic standards in the CTE course; the total number of standards contained in the academic course; and the percentage of alignment to the CTE course.

Courses	Anatomy/ Physiology Honors	Astronomy Solar/Galactic Honors	Biology 1	Chemistry 1	Earth-Space Science	Environmental Science	Genetics	Integrated Science	Marine Science 1 Honors	Physical Science	Physics 1
8601110	1/87 1%	14/80 18%	10/83 12%	17/69 25%	9/67 13%	15/70 21%	6/69 9%	12/82 15%	14/66 21%	22/74 30%	15/72 21%
8601120	1/87 1%	14/80 18%	10/83 12%	17/69 25%	9/67 13%	15/70 21%	6/69 9%	12/82 15%	14/66 21%	22/74 30%	15/72 21%
8601130	1/87 1%	11/80 14%	8/83 10%	13/69 19%	6/67 9%	11/70 16%	5/69 7%	10/82 12%	9/66 14%	18/74 24%	12/72 17%

** *Alignment pending review* # *Alignment attempted, but no correlation to academic course*

Courses	Algebra 1	Algebra 2	Geometry	English 1	English 2	English 3	English 4
8601110	**	**	**	**	**	**	**
8601120	**	**	**	**	**	**	**

Courses	Algebra 1	Algebra 2	Geometry	English 1	English 2	English 3	English 4
8601130	**	**	**	**	**	**	**

** *Alignment pending review* # *Alignment attempted, but no correlation to academic course*

Florida Standards for Technical Subjects

Florida Standards (FS) for English Language Arts and Literacy in History/Social Studies, Science, and Technical Subjects are the critical reading and writing literacy standards designed for grade 6 and above. These standards are predicated on teachers of history/social studies, science, and technical subjects using their content area expertise to help students meet the particular challenges of reading, writing, speaking, listening, and language in their respective fields. It is important to note that the 6-12 literacy standards in history/social studies, science, and technical subjects are not meant to replace content standards in those areas but rather to supplement them.

This curriculum framework incorporates the grades 9-10 reading and writing literacy standards in the first two courses of this CTE program and grade 11-12 reading and writing literacy standards in the third and fourth courses of this CTE program. The standards for Mathematical Practices describe varieties of expertise that educators at all levels should seek to develop in their students. These practices rest on important "processes and proficiencies" with longstanding importance in mathematics education. This curriculum framework incorporates the appropriate mathematical practices in the first four courses of this CTE program.

Common Career Technical Core – Career Ready Practices

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

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

2. Apply appropriate academic and technical skills.

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

4. Communicate clearly, effectively and with reason.

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

6. Demonstrate creativity and innovation.

7. Employ valid and reliable research strategies.

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

9. Model integrity, ethical leadership and effective management.

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

11. Use technology to enhance productivity.

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

Standards

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

01.0 Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Materials and Processes Technology.
02.0 Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Materials and Processes Technology.
03.0 Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Materials and Processes Technology.
04.0 Demonstrate an understanding of the characteristics and scope of technology.
05.0 Demonstrate an understanding of the core concepts of technology.
06.0 Demonstrate an understanding of the relationships among technologies and the connections between technology and other fields of study.
07.0 Demonstrate an understanding of the cultural, social, economic, and political effects of technology.
08.0 Demonstrate an understanding of the effects of technology on the environment.
09.0 Demonstrate an understanding of the role of society in the development and use of technology.
10.0 Demonstrate an understanding of the influence of technology on history.
11.0 Demonstrate an understanding of the attributes of design.
12.0 Demonstrate an understanding of engineering design.
13.0 Demonstrate an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving.
14.0 Demonstrate abilities to apply the design process.
15.0 Demonstrate the abilities to use and maintain technological products and systems.
16.0 Demonstrate the abilities to assess the impact of products and systems.
17.0 Demonstrate an understanding of and be able to select and use manufacturing technologies.
18.0 Demonstrate safe and appropriate use of tools, machines, and materials in materials & processes technology.
19.0 Demonstrate the ability to properly identify, organize, plan, and allocate resources.
20.0 Demonstrate an understanding of entrepreneurship.
21.0 Demonstrate technical knowledge and skills associated with pre-processing activities and practices of industrial materials.
22.0 Demonstrate technical knowledge and skills associated with processing activities and practices of industrial materials.
23.0 Demonstrate technical knowledge and skills associated with post-processing activities and practices of industrial materials.
24.0 Perform advanced study and technical skills related to industrial materials and processes.
25.0 Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Materials and Processes Technology.
26.0 Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Materials and Processes Technology.
27.0 Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Materials and Processes Technology.
28.0 Demonstrate understanding of career opportunities and requirements in the field of materials and processes technology.

Florida Department of Education
Student Performance Standards

Course Title: **Materials and Processes Technology I**
Course Number: **8601110**
Course Credit: **1**

Course Description:
This course provides students with an introduction to the knowledge, human relations, and technical skills of industrial materials and processes technology.

Florida Standards			Correlation to CTE Program Standard #
01.0	Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Materials and Processes Technology.		
	01.01 Key Ideas and Details		
	01.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. LAFS.910.RST.1.1	
	01.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.910.RST.1.2	
	01.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.910.RST.1.3	
	01.02 Craft and Structure		
	01.02.1	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. LAFS.910.RST.2.4	
	01.02.2	Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). LAFS.910.RST.2.5	
	01.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. LAFS.910.RST.2.6	

Florida Standards			Correlation to CTE Program Standard #
01.03	Integration of Knowledge and Ideas		
	01.03.1	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. LAFS.910.RST.3.7	
	01.03.2	Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. LAFS.910.RST.3.8	
	01.03.3	Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. LAFS.910.RST.3.9	
01.04	Range of Reading and Level of Text Complexity		
	01.04.1	By the end of grade 9, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	01.04.2	By the end of grade 10, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 9–10 text complexity band independently and proficiently. LAFS.910.RST.4.10	
02.0	Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Materials and Processes Technology.		
02.01	Text Types and Purposes		
	02.01.1	Write arguments focused on discipline-specific content. LAFS.910.WHST.1.1	
	02.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.910.WHST.1.2	
02.02	Production and Distribution of Writing		
	02.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.910.WHST.2.4	
	02.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.910.WHST.2.5	

Florida Standards			Correlation to CTE Program Standard #
	02.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. LAFS.910.WHST.2.6	
02.03	Research to Build and Present Knowledge		
	02.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.910.WHST.3.7	
	02.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. LAFS.910.WHST.3.8	
	02.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.910.WHST.3.9	
02.04	Range of Writing		
	02.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.910.WHST.4.10	
03.0	Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Materials and Processes Technology.		
03.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1		
03.02	Reason abstractly and quantitatively. MAFS.K12.MP.2.1		
03.03	Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1		
03.04	Model with mathematics. MAFS.K12.MP.4.1		
03.05	Use appropriate tools strategically. MAFS.K12.MP.5.1		

Florida Standards	Correlation to CTE Program Standard #
03.06 Attend to precision. MAFS.K12.MP.6.1	
03.07 Look for and make use of structure. MAFS.K12.MP.7.1	
03.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA.

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
04.0 Demonstrate an understanding of the characteristics and scope of technology. – The student will be able to:		
04.01 Illustrate the nature and development of technological knowledge and processes.		
04.02 Graph the rapid increase in the rate of technological development and diffusion.		
04.03 Conduct specific, goal-directed research related to inventions and innovations.		
05.0 Demonstrate an understanding of the core concepts of technology. – The student will be able to:		SC.912.L.17.11,16,19, 20; SC.912.N.1.1
05.01 Apply systems thinking logic and creativity with appropriate compromises in complex real-life problems.		
05.02 Discuss technological systems, which are the building blocks of technology, are embedded within larger technological, social, and environmental systems.		
05.03 Assess the stability of a technological system and its influence by all of the components in the system, especially those in the feedback loop.		
05.04 Select resources involving trade-offs between competing values, such as availability, cost, desirability, and waste.		
05.05 Identify the criteria and constraints of a product or system and determine how they affect the final design and development.		
05.06 Implement strategies for optimizing a technological process or methodology of designing or making a product, dependent on criteria and constraints.		
05.07 Organize a management system as the process of planning, organizing, and controlling work.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
06.0	Demonstrate an understanding of the relationships among technologies and the connections between technology and other fields of study. – The student will be able to:		SC.912.N.1.3, 4; 2.4, 5
06.01	Discuss technology transfer occurring when a new user applies an existing innovation developed for one purpose in a different function.		
06.02	Identify technological innovations resulting when ideas, knowledge, or skills are shared within a technology, among technologies, or across other fields.		
06.03	Outline the process of patenting to protect a technological idea.		
06.04	Identify technological progresses that promote the advancement of science and mathematics.		
07.0	Demonstrate an understanding of the cultural, social, economic, and political effects of technology. – The student will be able to:		SC.912.N.2.4, 5
07.01	Compare the use of technology involving weighing the trade-offs between the positive and negative effects.		
07.02	Debate the cultural, social, economic, and political changes caused by the transfer of a technology from one society to another.		
08.0	Demonstrate an understanding of the effects of technology on the environment. – The student will be able to:		SC.912.L.17.8, 11, 16, 17; SC.912.P.12.5
08.01	Compare trade-offs of developing technologies to reduce the use of resources.		
08.02	Assess technologies devised to reduce the negative consequences of other technologies.		
08.03	Make decisions about the implementation of technologies involving the weighing of trade-offs between predicted positive and negative effects on the environment.		
09.0	Demonstrate an understanding of the role of society in the development and use of technology. – The student will be able to:		SC.912.N.2.4, 5
09.01	Investigate how different cultures develop their own technologies to satisfy their individual and shared needs, wants, and values.		
09.02	Collect societal opinions and demands, as well as corporate cultures to use as a basis for deciding whether or not to develop a technology.		
09.03	Identify a number of different factors, such as advertising, the strength of the economy, the goals of a company, and the latest fads as contributors to shaping the design of and demand for various technologies.		
10.0	Demonstrate an understanding of the influence of technology on history. – The student will be able to:		SC.912.N.1.1, 5, 7; 2.4, 5
10.01	Research how the evolution of civilization has been directly affected by, and has in turn affected, the development and use of tools and materials.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
10.02	Describe the history of technology as a powerful force in reshaping the social, cultural, political, and economic landscape.		
10.03	Discuss that early in the history of technology, the development of many tools and machines was based not on scientific knowledge, but on technological know-how.		
10.04	Define the Iron Age as the use of iron and steel as the primary materials for tools.		
10.05	Define the Middle Ages and its development of many technological devices that produced long-lasting effects on technology and society.		
10.06	Define the Renaissance, a time of rebirth of the arts and humanities, as an important development in the history of technology.		
10.07	Define the Industrial Revolution as the development of continuous manufacturing, improved education and leisure time.		
10.08	Define the Information Age and its placement of emphasis on the processing and exchange of information.		
11.0	Demonstrate an understanding of the attributes of design. – The student will be able to:		SC.912.N.1.1; 3.5
11.01	Recognize the design process; including defining a problem, brainstorming, researching and generating ideas, identifying criteria and specifying constraints, exploring possibilities, selecting an approach, developing a design proposal, making a model or prototype, testing and evaluating the design using specifications, refining the design, creating or making it, and communicating processes and results.		
11.02	Restate design problems that are seldom presented in a clearly defined form.		
11.03	Check and critique a design continually, and improve and revise the idea of the design as needed.		
11.04	List competing requirements of a design, such as criteria, constraints, and efficiency.		
12.0	Demonstrate an understanding of engineering design. – The student will be able to:		SC.912.N.1.1, 7; 3.5
12.01	Identify design principles used to evaluate existing designs, to collect data, and to guide the design process.		
12.02	Describe the influence of personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly on the engineering design process.		
12.03	Construct a prototype or working model used to test a design concept by making actual observations and necessary adjustments.		
12.04	Identify factors taken into account in the process of engineering.		
13.0	Demonstrate an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving. – The student will be able to:		SC.912.N.1.1, 3, 6; 2.1, 2, 5; 3.5 SC.912.P.10.3

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
13.01	Define research and development as a specific problem-solving approach that is used intensively in business and industry to prepare devices and systems for the marketplace.		
13.02	Identify research needed to solve technological problems.		
13.03	Differentiate between technological and non-technological problems, and identify which problems can be solved using technology.		
13.04	Utilize a multidisciplinary approach to solving technological problems.		
14.0	Demonstrate abilities to apply the design process. – The student will be able to:		SC.912.N.1.1, 3, 6; 2.1, 2, 5; 3.5 SC.912.P.10.3
14.01	Identify the design problem to solve and decide whether or not to address it.		
14.02	Identify criteria and constraints and determine how these will affect the design process.		
14.03	Refine a design by using prototypes and modeling to ensure quality, efficiency, and productivity of the final product.		
14.04	Evaluate the design solution using conceptual, physical, and mathematical models at various intervals of the design process in order to check for proper design and to note areas where improvements are needed.		
14.05	Develop and produce a product or system using a design process.		
14.06	Evaluate final solutions and communicate observation, processes, and results of the entire design process, using verbal, graphic, quantitative, virtual, and written means, in addition to three-dimensional models.		
15.0	Demonstrate the abilities to use and maintain technological products and systems. – The student will be able to:		SC.912.N.1.1, 3, 6; 2.1, 2, 5; 3.5 SC.912.P.10.3
15.01	Document processes and procedures and communicate them to different audiences using appropriate oral and written techniques.		
15.02	Diagnose a system that is malfunctioning and use tools, materials, machines, and knowledge to repair it.		
15.03	Troubleshoot, analyze, and maintain systems to ensure safe and proper function and precision.		
15.04	Operate systems so that they function in the way they were designed.		
15.05	Use computers and calculators to access, retrieve, organize, process, maintain, interpret, and evaluate data and information in order to communicate.		
16.0	Demonstrate the abilities to assess the impact of products and systems. – The student will be able to:		SC.912.N.1.1, 3, 6; 2.1, 2, 5; 3.5 SC.912.P.10.3

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
16.01	Collect information and evaluate its quality.		
16.02	Evaluate data, analyze trends, and draw conclusions regarding the effect of technology on the individual, society, and environment.		
16.03	Use assessment techniques, such as trend analysis and experimentation to make decisions about the future development of technology.		
16.04	Identify forecasting techniques to evaluate the results of altering natural systems.		
17.0	Demonstrate an understanding of and be able to select and use manufacturing technologies. – The student will be able to:		SC.912.N.1.1, 3, 6; 2.1, 2, 5; 3.5 SC.912.P.10.3
17.01	Service products to keep them in good operating condition.		
17.02	Classify materials based on their qualities as natural, synthetic, or mixed.		
17.03	Classify goods as durable goods designed to operator for a long period of time, or non-durable goods designed to operate for a short period of time.		
17.04	Identify and classify manufacturing systems into types, such as customized production, batch production, and continuous production.		
17.05	Discuss the interchangeability of parts to increase the effectiveness of manufacturing processes.		
17.06	Identify chemical technologies providing a means for humans to alter or modify materials and to produce chemical products.		
17.07	Employ marketing techniques involving establishing a product's identity, conducting research on its potential, advertising it, distributing it, and selling it.		
18.0	Demonstrate safe and appropriate use of tools, machines, and materials in materials & processes technology.. – The student will be able to:		
18.01	Select appropriate tools, procedures, and/or equipment.		
18.02	Demonstrate the safe usage of appropriate tools, procedures, and operation of equipment.		
18.03	Follow laboratory safety rules and procedures.		
18.04	Demonstrate good housekeeping at workstation within total laboratory.		
18.05	Identify color-coding safety standards.		
18.06	Explain fire prevention and safety precautions and practices for extinguishing fires.		
18.07	Identify harmful effects/potential dangers of familiar hazardous substances/devices to people and the environment.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
19.0	Demonstrate the ability to properly identify, organize, plan, and allocate resources. – The student will be able to:		SC.912.N.1.1, 3, 6; 2.1, 2, 5; 3.5 SC.912.P.10.3
19.01	Demonstrate the ability to select goal-relevant activities, rank them, allocate time, and prepare and follow schedules.		
19.02	Use or prepare budgets, make forecasts, keep records, and make adjustments to meet objectives.		
19.03	Demonstrate the ability to acquire, store, allocate, and use materials or space efficiently.		
19.04	Display knowledge of the efficient use of human resources.		
20.0	Demonstrate an understanding of entrepreneurship. – The student will be able to:		
20.01	Define entrepreneurship.		
20.02	Describe the importance of entrepreneurship to the American economy.		
20.03	List the advantages and disadvantages of business ownership.		
20.04	Identify the risks involved in ownership of a business.		
20.05	Identify the necessary personal characteristics of a successful entrepreneur.		
20.06	Identify the business skills needed to operate a small business efficiently and effectively.		
21.0	Demonstrate technical knowledge and skills associated with pre-processing activities and practices of industrial materials. – The student will be able to:		SC.912.N.1.1, 3, 6; 2.1, 2, 5; 3.5 SC.912.P.10.3
21.01	Define and describe the term “pre-processing” as it relates to industrial materials.		
21.02	Describe the technical processes of extracting materials from natural resources.		
21.03	Locate and order industrial materials.		
21.04	Arrange for the appropriate transportation of industrial materials.		
21.05	Store and protect industrial materials properly.		
21.06	Follow proper precautions in the receiving, unpacking, and handling of industrial materials.		
22.0	Demonstrate technical knowledge and skills associated with processing activities and practices of industrial materials. – The student will be able to:		SC.912.P.8.1, 2, 11; 10.3, 4, 5, 7, 15, 18; 12.11, 12

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
22.01	Define and describe “processing” as it relates to industrial materials.		
22.02	Demonstrate technical processing of a variety of industrial materials, such as wood, metals, and plastic.		
22.03	Apply the technical processes of separating and forming using a variety of industrial materials.		
22.04	Apply the technical processes of conditioning a variety of industrial materials.		
22.05	Apply the technical processes of combining in the fabrication and finishing of a product.		
23.0	Demonstrate technical knowledge and skills associated with post-processing activities and practices of industrial materials. – The student will be able to:		SC.912.N.1.1, SC.912.L.17.13, 20
23.01	Define and describe “post-processing” as it relates to industrial materials.		
23.02	Identify processes for distributing products made of industrial materials.		
23.03	Describe processes for installing products made of industrial materials.		
23.04	Describe processes for maintaining products made of industrial materials.		
23.05	Describe processes for altering products made of industrial materials.		
23.06	Describe processes for servicing products made of industrial materials.		

Florida Department of Education
Student Performance Standards

Course Title: **Materials and Processes Technology II**
Course Number: **8601120**
Course Credit: **1**

Course Description:
This course provides students with an intermediate understanding of the knowledge, human relations, and technical skills of industrial materials and processes technology.

Florida Standards			Correlation to CTE Program Standard #
01.0	Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Materials and Processes Technology.		
01.01	Key Ideas and Details		
01.01.1		Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. LAFS.910.RST.1.1	
01.01.2		Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.910.RST.1.2	
01.01.3		Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.910.RST.1.3	
01.02	Craft and Structure		
01.02.1		Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. LAFS.910.RST.2.4	
01.02.2		Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). LAFS.910.RST.2.5	
01.02.3		Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. LAFS.910.RST.2.6	

Florida Standards			Correlation to CTE Program Standard #
01.03	Integration of Knowledge and Ideas		
	01.03.1	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. LAFS.910.RST.3.7	
	01.03.2	Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. LAFS.910.RST.3.8	
	01.03.3	Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. LAFS.910.RST.3.9	
01.04	Range of Reading and Level of Text Complexity		
	01.04.1	By the end of grade 9, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	01.04.2	By the end of grade 10, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 9–10 text complexity band independently and proficiently. LAFS.910.RST.4.10	
02.0	Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Materials and Processes Technology.		
02.01	Text Types and Purposes		
	02.01.1	Write arguments focused on discipline-specific content. LAFS.910.WHST.1.1	
	02.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.910.WHST.1.2	
02.02	Production and Distribution of Writing		
	02.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.910.WHST.2.4	
	02.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.910.WHST.2.5	

Florida Standards			Correlation to CTE Program Standard #
	02.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. LAFS.910.WHST.2.6	
02.03	Research to Build and Present Knowledge		
	02.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.910.WHST.3.7	
	02.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. LAFS.910.WHST.3.8	
	02.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.910.WHST.3.9	
02.04	Range of Writing		
	02.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.910.WHST.4.10	
03.0	Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Materials and Processes Technology.		
03.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1		
03.02	Reason abstractly and quantitatively. MAFS.K12.MP.2.1		
03.03	Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1		
03.04	Model with mathematics. MAFS.K12.MP.4.1		
03.05	Use appropriate tools strategically. MAFS.K12.MP.5.1		

Florida Standards	Correlation to CTE Program Standard #
03.06 Attend to precision. MAFS.K12.MP.6.1	
03.07 Look for and make use of structure. MAFS.K12.MP.7.1	
03.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA.

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
04.0	Demonstrate an understanding of the characteristics and scope of technology. – The student will be able to:		
04.01	Discuss the nature and development of technological knowledge and processes.		
04.02	Explain the rapid increase in the rate of technological development and diffusion.		
04.03	Conduct specific, goal-directed research related to inventions and innovations.		
05.0	Demonstrate an understanding of the core concepts of technology. – The student will be able to:		SC.912.L.17.11,16,19, 20; SC.912.N.1.1
05.01	Identify systems thinking logic and creativity with appropriate compromises in complex real-life problems.		
05.02	Define technological systems, which are the building blocks of technology, are embedded within larger technological, social, and environmental systems.		
05.03	Identify the stability of a technological system and its influence by all of the components in the system, especially those in the feedback loop.		
05.04	Identify resources involves trade-offs between competing values, such as availability, cost, desirability, and waste.		
05.05	Identify the criteria and constraints of a product or system and determine how they affect the final design and development.		
05.06	List strategies for optimizing a technological process or methodology of designing or making a product, dependent on criteria and constraints.		
05.07	Define a management system as the process of planning, organizing, and controlling work.		
06.0	Demonstrate an understanding of the relationships among technologies and the connections between technology and other fields of study. – The student will be able to:		SC.912.N.1.3, 4; 2.4, 5

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
06.01	Identify technology transfer occurring when a new user applies an existing innovation developed for one purpose in a different function.		
06.02	Outline the process of patenting to protect a technological idea.		
06.03	Identify technological progresses that promote the advancement of science and mathematics.		
07.0	Demonstrate an understanding of the cultural, social, economic, and political effects of technology. – The student will be able to:		SC.912.N.1.3, 4; 2.4, 5
07.01	Classify the use of technology involving weighing the trade-offs between the positive and negative effects.		
07.02	List the cultural, social, economic, and political changes caused by the transfer of a technology from one society to another.		
08.0	Demonstrate an understanding of the effects of technology on the environment. – The student will be able to:		SC.912.L.17.8, 11, 16, 17; SC.912.P.12.5
08.01	List trade-offs of developing technologies to reduce the use of resources.		
08.02	Identify technologies devised to reduce the negative consequences of other technologies.		
08.03	Discuss the implementation of technologies involving the weighing of trade-offs between predicted positive and negative effects on the environment.		
09.0	Demonstrate an understanding of the role of society in the development and use of technology. – The student will be able to:		SC.912.N.2.4, 5
09.01	Report how different cultures develop their own technologies to satisfy their individual and shared needs, wants, and values.		
09.02	Consider societal opinions and demands, as well as corporate cultures to use as a basis for deciding whether or not to develop a technology.		
09.03	Consider a number of different factors, such as advertising, the strength of the economy, the goals of a company, and the latest fads as contributors to shaping the design of and demand for various technologies.		
10.0	Demonstrate an understanding of the influence of technology on history. – The student will be able to:		SC.912.N.1.1, 5, 7; 2.4, 5
10.01	Discuss how the evolution of civilization has been directly affected by, and has in turn affected, the development and use of tools and materials.		
10.02	Discuss the history of technology as a powerful force in reshaping the social, cultural, political, and economic landscape.		
10.03	Debate that early in the history of technology, the development of many tools and machines was based not on scientific knowledge, but on technological know-how.		
10.04	Discuss the Iron Age as the use of iron and steel as the primary materials for tools.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
10.05	Discuss the Middle Ages and its development of many technological devices that produced long-lasting effects on technology and society.		
10.06	Discuss the Renaissance, a time of rebirth of the arts and humanities, as an important development in the history of technology.		
10.07	Discuss the Industrial Revolution as the development of continuous manufacturing, improved education and leisure time.		
10.08	Discuss the Information Age and its placement of emphasis on the processing and exchange of information.		
11.0	Demonstrate an understanding of the attributes of design. – The student will be able to:		SC.912.N.1.1; 3.5
11.01	Describe the design process; including defining a problem, brainstorming, researching and generating ideas, identifying criteria and specifying constraints, exploring possibilities, selecting an approach, developing a design proposal, making a model or prototype, testing and evaluating the design using specifications, refining the design, creating or making it, and communicating processes and results.		
11.02	Translate design problems that are seldom presented in a clearly defined form.		
11.03	Evaluate a design continually, and improve and revise the idea of the design as needed.		
11.04	Analyze competing requirements of a design, such as criteria, constraints, and efficiency.		
12.0	Demonstrate an understanding of engineering design. – The student will be able to:		SC.912.N.1.1, 7; 3.5
12.01	Investigate design principles used to evaluate existing designs, to collect data, and to guide the design process.		
12.02	Examine the influence of personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly on the engineering design process.		
12.03	Construct a prototype or working model used to test a design concept by making actual observations and necessary adjustments.		
12.04	Consider factors taken into account in the process of engineering.		
13.0	Demonstrate an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving. – The student will be able to:		SC.912.N.1.1, 3, 6; 2.1, 2, 5; 3.5 SC.912.P.10.3
13.01	Employ research and development as a specific problem solving approach that is used intensively in business and industry to prepare devices and systems for the marketplace.		
13.02	Conduct research needed to solve technological problems.		
13.03	Differentiate between technological and non-technological problems, and identify which problems can be solved using technology.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
13.04	Utilize a multidisciplinary approach to solving technological problems.		
14.0	Demonstrate abilities to apply the design process. – The student will be able to:		SC.912.N.1.1, 3, 6; 2.1, 2, 5; 3.5 SC.912.P.10.3
14.01	Interpret the design problem to solve and decide whether or not to address it.		
14.02	Consider criteria and constraints and determine how these will affect the design process.		
14.03	Refine a design by using prototypes and modeling to ensure quality, efficiency, and productivity of the final product.		
14.04	Evaluate the design solution using conceptual, physical, and mathematical models at various intervals of the design process in order to check for proper design and to note areas where improvements are needed.		
14.05	Develop and produce a product or system using a design process.		
14.06	Evaluate final solutions and communicate observation, processes, and results of the entire design process, using verbal, graphic, quantitative, virtual, and written means, in addition to three-dimensional models.		
15.0	Demonstrate the abilities to use and maintain technological products and systems. – The student will be able to:		SC.912.N.1.1, 3, 6; 2.1, 2, 5; 3.5 SC.912.P.10.3
15.01	Document processes and procedures and communicate them to different audiences using appropriate oral and written techniques.		
15.02	Diagnose a system that is malfunctioning and use tools, materials, machines, and knowledge to repair it.		
15.03	Troubleshoot, analyze, and maintain systems to ensure safe and proper function and precision.		
15.04	Operate systems so that they function in the way they were designed.		
15.05	Use computers and calculators to access, retrieve, organize, process, maintain, interpret, and evaluate data and information in order to communicate.		
16.0	Demonstrate the abilities to assess the impact of products and systems. – The student will be able to:		SC.912.N.1.1, 3, 6; 2.1, 2, 5; 3.5 SC.912.P.10.3
16.01	Collect information and evaluate its quality.		
16.02	Synthesize data, analyze trends, and draw conclusions regarding the effect of technology on the individual, society, and environment.		
16.03	Apply assessment techniques, such as trend analysis and experimentation to make decisions about the future development of technology.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
16.04	Design forecasting techniques to evaluate the results of altering natural systems.		
17.0	Demonstrate an understanding of and be able to select and use manufacturing technologies. – The student will be able to:		SC.912.N.1.1, 3, 6; 2.1, 2, 5; 3.5 SC.912.P.10.3
17.01	Service products to keep them in good operating condition.		
17.02	Classify materials based on their qualities as natural, synthetic, or mixed.		
17.03	Classify goods as durable goods designed to operate for a long period of time, or non-durable goods designed to operate for a short period of time.		
17.04	Identify and classify manufacturing systems into types, such as customized production, batch production, and continuous production.		
17.05	Discuss the interchangeability of parts to increase the effectiveness of manufacturing processes.		
17.06	Identify chemical technologies providing a means for humans to alter or modify materials and to produce chemical products.		
17.07	Employ marketing techniques involving establishing a product's identity, conducting research on its potential, advertising it, distributing it, and selling it.		
18.0	Demonstrate safe and appropriate use of tools, machines, and materials in materials & processes technology. – The student will be able to:		
18.01	Select appropriate tools, procedures, and/or equipment.		
18.02	Demonstrate the safe usage of appropriate tools, procedures, and operation of equipment.		
18.03	Follow laboratory safety rules and procedures.		
18.04	Demonstrate good housekeeping at workstation within total laboratory.		
18.05	Identify color-coding safety standards.		
18.06	Explain fire prevention and safety precautions and practices for extinguishing fires.		
18.07	Identify harmful effects/potential dangers of familiar hazardous substances/devices to people and the environment.		
19.0	Demonstrate the ability to properly identify, organize, plan, and allocate resources. – The student will be able to:		SC.912.N.1.1, 3, 6; 2.1, 2, 5; 3.5 SC.912.P.10.3
19.01	Demonstrate the ability to select goal-relevant activities, rank them, allocate time, and prepare and follow schedules.		
19.02	Use or prepare budgets, make forecasts, keep records, and make adjustments to meet objectives.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
19.03	Demonstrate the ability to acquire, store, allocate, and use materials or space efficiently.		
19.04	Display knowledge of the efficient use of human resources.		
20.0	Demonstrate an understanding of entrepreneurship. – The student will be able to:		
20.01	Define entrepreneurship.		
20.02	Describe the importance of entrepreneurship to the American economy.		
20.03	List the advantages and disadvantages of business ownership.		
20.04	Identify the risks involved in ownership of a business.		
20.05	Identify the necessary personal characteristics of a successful entrepreneur.		
20.06	Identify the business skills needed to operate a small business efficiently and effectively.		
21.0	Demonstrate technical knowledge and skills associated with pre-processing activities and practices of industrial materials. – The student will be able to:		SC.912.N.1.1, 3, 6; 2.1, 2, 5; 3.5 SC.912.P.10.3
21.01	Define and describe the term “pre-processing” as it relates to industrial materials.		
21.02	Describe the technical processes of extracting materials from natural resources.		
21.03	Locate and order industrial materials.		
21.04	Arrange for the appropriate transportation of industrial materials.		
21.05	Store and protect industrial materials properly.		
21.06	Follow proper precautions in the receiving, unpacking, and handling of industrial materials.		
22.0	Demonstrate technical knowledge and skills associated with processing activities and practices of industrial materials. – The student will be able to:		SC.912.P.8.1, 2, 11; 10.3, 4, 5, 7, 15, 18; 12.11, 12
22.01	Define and describe “processing” as it relates to industrial materials.		
22.02	Demonstrate technical processing using a variety of composite and synthetic industrial materials.		
22.03	Demonstrate understanding of both manual and automated processes.		
22.04	Apply the technical processes of separating and forming a variety of industrial materials.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	22.05 Apply the technical processes of conditioning a variety of industrial materials.		
	22.06 Apply the technical processes of combining in the fabrication and finishing of a product.		
23.0	Demonstrate technical knowledge and skills associated with post-processing activities and practices of industrial materials. – The student will be able to:		SC.912.N.1.1, SC.912.L.17.13, 20
	23.01 Define and describe “post-processing” as it relates to industrial materials.		
	23.02 Identify processes for distributing products made of industrial materials.		
	23.03 Describe processes for installing products made of industrial materials.		
	23.04 Describe processes for maintaining products made of industrial materials.		
	23.05 Describe processes for altering products made of industrial materials.		
	23.06 Describe processes for servicing products made of industrial materials.		
24.0	Perform advanced study and technical skills related to materials and processes. – The student will be able to:		SC.912.N.1.1
	24.01 Select an individual or group project in cooperation with the teacher.		
	24.02 Develop a written plan of work to carry out the project.		
	24.03 Show evidence of technical study in support of the project.		
	24.04 Perform skills related to the project.		
	24.05 Complete the project as planned.		

Florida Department of Education
Student Performance Standards

Course Title: **Materials and Processes Technology III**
Course Number: **8601130**
Course Credit: **1**

Course Description:
This course provides students with an advanced understanding of the knowledge, human relations, and technical skills of industrial materials and processes technology.

Florida Standards			Correlation to CTE Program Standard #
25.0	Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Materials and Processes Technology.		
	25.01 Key Ideas and Details		
	25.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. LAFS.1112.RST.1.1	
	25.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.1112.RST.1.2	
	25.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.1112.RST.1.3	
	25.02 Craft and Structure		
	25.02.1	Determine the meaning of symbols key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. LAFS.1112.RST.2.4	
	25.02.2	Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. LAFS.1112.RST.2.5	
	25.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. LAFS.1112.RST.2.6	

Florida Standards			Correlation to CTE Program Standard #
25.03	Integration of Knowledge and Ideas		
	25.03.1	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g. quantitative data, video, multimedia) in order to address a question or solve a problem. LAFS.1112.RST.3.7	
	25.03.2	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. LAFS.1112.RST.3.8	
	25.03.3	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. LAFS.1112.RST.3.9	
25.04	Range of Reading and Level of Text Complexity		
	25.04.1	By the end of grade 11, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	25.04.2	By the end of grade 12, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 11–CCR text complexity band independently and proficiently. LAFS.1112.RST.4.10	
26.0	Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Materials and Processes Technology.		
26.01	Text Types and Purposes		
	26.01.1	Write arguments focused on discipline-specific content. LAFS.1112.WHST.1.1	
	26.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.1112.WHST.1.2	
26.02	Production and Distribution of Writing		
	26.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.1112.WHST.2.4	

Florida Standards			Correlation to CTE Program Standard #
	26.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.1112.WHST.2.5	
	26.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. LAFS.1112.WHST.2.6	
	26.03	Research to Build and Present Knowledge	
	26.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.1112.WHST.3.7	
	26.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. LAFS.1112.WHST.3.8	
	26.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.1112.WHST.3.9	
	26.04	Range of Writing	
	26.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.1112.WHST.4.10	
27.0	Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Materials and Processes Technology.		
	27.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	
	27.02	Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
	27.03	Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	

Florida Standards	Correlation to CTE Program Standard #
27.04 Model with mathematics. MAFS.K12.MP.4.1	
27.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
27.06 Attend to precision. MAFS.K12.MP.6.1	
27.07 Look for and make use of structure. MAFS.K12.MP.7.1	
27.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA.

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
04.0 Demonstrate an understanding of the characteristics and scope of technology. – The student will be able to:		
04.01 Discuss the nature and development of technological knowledge and processes.		
04.02 Explain the rapid increase in the rate of technological development and diffusion.		
04.03 Conduct specific, goal-directed research related to inventions and innovations.		
05.0 Demonstrate an understanding of the core concepts of technology. – The student will be able to:		SC.912.L.17.11, 16, 19, 20; SC.912.N.1.1
05.01 Identify systems thinking logic and creativity with appropriate compromises in complex real-life problems.		
05.02 Assess technological systems, which are the building blocks of technology, are embedded within larger technological, social, and environmental systems.		
05.03 Assess the stability of a technological system and its influence by all of the components in the system, especially those in the feedback loop.		
05.04 Compare resources involves trade-offs between competing values, such as availability, cost, desirability, and waste.		
05.05 Identify the criteria and constraints of a product or system and determine how they affect the final design and development.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
05.06	Propose strategies for optimizing a technological process or methodology of designing or making a product, dependent on criteria and constraints.		
05.07	Organize a management system as the process of planning, organizing, and controlling work.		
06.0	Demonstrate an understanding of the relationships among technologies and the connections between technology and other fields of study. – The student will be able to:		
06.01	Create technology transfer occurring when a new user applies an existing innovation developed for one purpose in a different function.		
06.02	Outline the process of patenting to protect a technological idea.		
06.03	Investigate technological progresses that promote the advancement of science and mathematics.		
09.0	Demonstrate an understanding of the role of society in the development and use of technology. – The student will be able to:		
09.01	Report how different cultures develop their own technologies to satisfy their individual and shared needs, wants, and values.		
09.02	Consider societal opinions and demands, as well as corporate cultures to use as a basis for deciding whether or not to develop a technology.		
09.03	Evaluate a number of different factors, such as advertising, the strength of the economy, the goals of a company, and the latest fads as contributors to shaping the design of and demand for various technologies.		
11.0	Demonstrate an understanding of the attributes of design. – The student will be able to:		SC.912.N.1.1; 3.5
11.01	Implement the design process; including defining a problem, brainstorming, researching and generating ideas, identifying criteria and specifying constraints, exploring possibilities, selecting an approach, developing a design proposal, making a model or prototype, testing and evaluating the design using specifications, refining the design, creating or making it, and communicating processes and results.		
11.02	Translate design problems that are seldom presented in a clearly defined form.		
11.03	Evaluate a design continually, and improve and revise the idea of the design as needed.		
11.04	Analyze competing requirements of a design, such as criteria, constraints, and efficiency.		
12.0	Demonstrate an understanding of engineering design. – The student will be able to:		SC.912.N.1.7; 3.5
12.01	Select design principles used to evaluate existing designs, to collect data, and to guide the design process.		
12.02	Examine the influence of personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly on the engineering design process.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
12.03	Construct a prototype or working model used to test a design concept by making actual observations and necessary adjustments.		
12.04	Evaluate factors taken into account in the process of engineering.		
13.0	Demonstrate an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving. – The student will be able to:		SC.912.N.1.1, 3, 6; 2.1, 2, 5; 3.5 SC.912.P.10.3
13.01	Employ research and development as a specific problem solving approach that is used intensively in business and industry to prepare devices and systems for the marketplace.		
13.02	Conduct research needed to solve technological problems.		
13.03	Differentiate between technological and non-technological problems, and identify which problems can be solved using technology.		
13.04	Utilize a multidisciplinary approach to solving technological problems.		
14.0	Demonstrate abilities to apply the design process. – The student will be able to:		SC.912.N.1.1, 3, 6; 2.1, 2, 5; 3.5 SC.912.P.10.3
14.01	Interpret the design problem to solve and decide whether or not to address it.		
14.02	Evaluate criteria and constraints and determine how these will affect the design process.		
14.03	Refine a design by using prototypes and modeling to ensure quality, efficiency, and productivity of the final product.		
14.04	Evaluate the design solution using conceptual, physical, and mathematical models at various intervals of the design process in order to check for proper design and to note areas where improvements are needed.		
14.05	Develop and produce a product or system using a design process.		
14.06	Evaluate final solutions and communicate observation, processes, and results of the entire design process, using verbal, graphic, quantitative, virtual, and written means, in addition to three-dimensional models.		
15.0	Demonstrate the abilities to use and maintain technological products and systems. – The student will be able to:		SC.912.N.1.1, 3, 6; 2.1, 2, 5; 3.5 SC.912.P.10.3
15.01	Document processes and procedures and communicate them to different audiences using appropriate oral and written techniques.		
15.02	Diagnose a system that is malfunctioning and use tools, materials, machines, and knowledge to repair it.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
15.03	Troubleshoot, analyze, and maintain systems to ensure safe and proper function and precision.		
15.04	Operate systems so that they function in the way they were designed.		
15.05	Use computers and calculators to access, retrieve, organize, process, maintain, interpret, and evaluate data and information in order to communicate.		
16.0	Demonstrate the abilities to assess the impact of products and systems. – The student will be able to:		SC.912.N.1.1, 3, 6; 2.1, 2, 5; 3.5 SC.912.P.10.3
16.01	Collect information and evaluate its quality.		
16.02	Synthesize data, analyze trends, and draw conclusions regarding the effect of technology on the individual, society, and environment.		
16.03	Apply assessment techniques, such as trend analysis and experimentation to make decisions about the future development of technology.		
16.04	Design forecasting techniques to evaluate the results of altering natural systems.		
17.0	Demonstrate an understanding of and be able to select and use manufacturing technologies. – The student will be able to:		SC.912.N.1.1, 3, 6; 2.1, 2, 5; 3.5 SC.912.P.10.3
17.01	Service products to keep them in good operating condition.		
17.02	Classify materials based on their qualities as natural, synthetic, or mixed.		
17.03	Classify goods as durable goods designed to operator for a long period of time, or non-durable goods designed to operate for a short period of time.		
17.04	Identify and classify manufacturing systems into types, such as customized production, batch production, and continuous production.		
17.05	Discuss the interchangeability of parts to increase the effectiveness of manufacturing processes.		
17.06	Identify chemical technologies providing a means for humans to alter or modify materials and to produce chemical products.		
17.07	Employ marketing techniques involving establishing a product's identity, conducting research on its potential, advertising it, distributing it, and selling it.		
18.0	Demonstrate safe and appropriate use of tools, machines, and materials in materials & processes technology. – The student will be able to:		
18.01	Select appropriate tools, procedures, and/or equipment.		
18.02	Demonstrate the safe usage of appropriate tools, procedures, and operation of equipment.		
18.03	Follow laboratory safety rules and procedures.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
18.04	Demonstrate good housekeeping at workstation within total laboratory.		
18.05	Identify color-coding safety standards.		
18.06	Explain fire prevention and safety precautions and practices for extinguishing fires.		
18.07	Identify harmful effects/potential dangers of familiar hazardous substances/devices to people and the environment.		
19.0	Demonstrate the ability to properly identify, organize, plan, and allocate resources. – The student will be able to:		SC.912.N.1.1, 3, 6; 2.1, 2, 5; 3.5 SC.912.P.10.3
19.01	Demonstrate the ability to select goal-relevant activities, rank them, allocate time, and prepare and follow schedules.		
19.02	Use or prepare budgets, make forecasts, keep records, and make adjustments to meet objectives.		
19.03	Demonstrate the ability to acquire, store, allocate, and use materials or space efficiently.		
19.04	Display knowledge of the efficient use of human resources.		
20.0	Demonstrate an understanding of entrepreneurship. – The student will be able to:		
20.01	Define entrepreneurship.		
20.02	Describe the importance of entrepreneurship to the American economy.		
20.03	Explain the advantages and disadvantages of business ownership.		
20.04	Identify the risks involved in ownership of a business.		
20.05	Identify the necessary personal characteristics of a successful entrepreneur.		
20.06	Identify the business skills needed to operate a small business efficiently and effectively.		
21.0	Demonstrate technical knowledge and skills associated with pre-processing activities and practices of industrial materials. – The student will be able to:		SC.912.N.1.1, 3, 6; 2.1, 2, 5; 3.5 SC.912.P.10.3
21.01	Define and describe the term “pre-processing” as it relates to industrial materials.		
21.02	Describe the technical processes of extracting materials from natural resources.		
21.03	Locate and order industrial materials.		
21.04	Arrange for the appropriate transportation of industrial materials.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	21.05 Store and protect industrial materials properly.		
	21.06 Follow proper precautions in the receiving, unpacking, and handling of industrial materials.		
22.0	Demonstrate technical knowledge and skills associated with processing activities and practices of industrial materials. – The student will be able to:		SC.912.P.8.1, 2, 11; 10.3, 4, 5, 7, 15, 18; 12.11, 12
	22.01 Define and describe “processing” as it relates to industrial materials.		
	22.02 Demonstrate technical processing using a variety of industrial materials.		
	22.03 Demonstrate technical ability to utilize automated processing equipment.		
	22.04 Apply the technical processes of separating and forming a variety of industrial materials.		
	22.05 Apply the technical processes of conditioning a variety of industrial materials.		
	22.06 Apply the technical processes of combining in the fabrication and finishing of a product.		
23.0	Demonstrate technical knowledge and skills associated with post-processing activities and practices of industrial materials. – The student will be able to:		SC.912.N.1.1, SC.912.L.17.13, 20
	23.01 Define and describe “post-processing” as it relates to industrial materials.		
	23.02 Identify processes for distributing products made of industrial materials.		
	23.03 Describe processes for installing products made of industrial materials.		
	23.04 Describe processes for maintaining products made of industrial materials.		
	23.05 Describe processes for altering products made of industrial materials.		
	23.06 Describe processes for servicing products made of industrial materials.		
24.0	Perform advanced study and technical skills related to industrial materials and processes. – The student will be able to:		SC.912.N.1.1
	24.01 Identify and research a design problem related to materials and processes.		
	24.02 Produce a detailed design and plan for the production of the solution.		
	24.03 Complete the advanced design project as planned.		
	24.04 Deliver a professional quality presentation of the design process and solution.		
28.0	Demonstrate understanding of career opportunities and requirements in the field of materials and processes technology. – The student will be able to:		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
28.01 Discuss individual interests related to a career in materials and processes.		
28.02 Explore career opportunities related to materials and processes.		
28.03 Explore secondary education opportunities related to materials and processes.		
28.04 Conduct a job search.		
28.05 Complete a job application form correctly.		
28.06 Demonstrate competence in job interview techniques.		
28.07 Create a professional resume and letter of introduction.		
28.08 Solicit awards, letters of recommendation and recognition.		
28.09 Organize work samples in a professional, presentable format.		

Additional Information

Laboratory Activities

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

Career and Technical Student Organization (CTSO)

The Florida Technology Student Association (FL-TSA) is the intercurricular career and technical student organization for providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

Cooperative Training – OJT

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

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 Occupational Completion Point (OCP) or a Modified Occupational Completion Point (MOCP). If needed, a student may enroll in the same career and technical course more than once. Documentation should be included in the IEP that clearly indicates that it is anticipated that the student may need an additional year to complete an OCP/MOCP. The student should work on different competencies and new applications of competencies each year toward completion of the OCP/MOCP. After achieving the competencies identified for the year, the student earns credit for the course. It is important to ensure that credits earned by students are reported accurately. The district's information system must be designed to accept multiple credits for the same course number for eligible students with disabilities.

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

Florida Department of Education
Curriculum Framework

Program Title: **Transportation Technology**
Program Type: **Non Career Preparatory**
Career Cluster: **Engineering & Technology Education**

Secondary – Non Career Preparatory	
Program Number	8601200
CIP Number	0821010500
Grade Level	9-12; 30, 31
Standard Length	3 credits
Teacher Certification	TEC ED 1 @2 ENG @7 7G AUTO MECH @7 7G DIESEL MEC @7 7G GASENG RPR @7 7G AUTO IND @7 %7G AIR MECH @7 7G TRANSPORT @4 @7 7G
CTSO	Florida Technology Student Association (FL-TSA)
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 transportation technology. 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, a study of power systems and the kinds and sources of energy. The content and activities will also include the study of entrepreneurship, safety, and leadership skills.

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

Program Structure

This program is a planned sequence of instruction consisting of three one-credit courses. The following table illustrates the program structure:

Course Number	Course Title	Length	Level	Graduation Requirement
8601210	Transportation Technology I	1 credit	2	VO
8601220	Transportation Technology II	1 credit	2	VO
8601230	Transportation Technology III	1 credit	3	VO

(Graduation Requirement Abbreviations- EQ= Equally Rigorous Science, PA= Practical Arts, EC= Economics, VO= Career and Technical Education)

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.

Academic Alignment Table

Academic alignment is an ongoing, collaborative effort of professional educators specializing in the fields of science, mathematics, English/language arts, and Career and Technical Education (CTE). This initiative supports CTE programs by improving student performance through the integration of academic content within CTE courses. Career and Technical Education courses that have been aligned to the Next Generation Sunshine State Standards for Science and the Florida Standards for Mathematics and English/Language Arts will show the following data: the quantity of academic standards in the CTE course; the total number of standards contained in the academic course; and the percentage of alignment to the CTE course.

Courses	Anatomy/ Physiology Honors	Astronomy Solar/Galactic Honors	Biology 1	Chemistry 1	Earth-Space Science	Environmental Science	Genetics	Integrated Science	Marine Science 1 Honors	Physical Science	Physics 1
8601210	**	**	**	**	**	**	**	**	**	**	**
8601220	**	**	**	**	**	**	**	**	**	**	**
8601230	**	**	**	**	**	**	**	**	**	**	**

*** Alignment pending review* *# Alignment attempted, but no correlation to academic course*

Courses	Algebra 1	Algebra 2	Geometry	English 1	English 2	English 3	English 4
8601210	**	**	**	**	**	**	**
8601220	**	**	**	**	**	**	**
8601230	**	**	**	**	**	**	**

*** Alignment pending review* *# Alignment attempted, but no correlation to academic course*

Florida Standards for Technical Subjects

Florida Standards (FS) for English Language Arts and Literacy in History/Social Studies, Science, and Technical Subjects are the critical reading and writing literacy standards designed for grade 6 and above. These standards are predicated on teachers of history/social studies, science, and technical subjects using their content area expertise to help students meet the particular challenges of reading, writing, speaking, listening, and language in their respective fields. It is important to note that the 6-12 literacy standards in history/social studies, science, and technical subjects are not meant to replace content standards in those areas but rather to supplement them.

This curriculum framework incorporates the grades 9-10 reading and writing literacy standards in the first two courses of this CTE program and grade 11-12 reading and writing literacy standards in the third and fourth courses of this CTE program. The standards for Mathematical Practices describe varieties of expertise that educators at all levels should seek to develop in their students. These practices rest on important "processes and proficiencies" with longstanding importance in mathematics education. This curriculum framework incorporates the appropriate mathematical practices in the first four courses of this CTE program.

Common Career Technical Core – Career Ready Practices

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

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

2. Apply appropriate academic and technical skills.

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

4. Communicate clearly, effectively and with reason.

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

6. Demonstrate creativity and innovation.

7. Employ valid and reliable research strategies.

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

9. Model integrity, ethical leadership and effective management.

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

11. Use technology to enhance productivity.

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

Standards

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

01.0 Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Transportation Technology.
02.0 Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Transportation Technology.
03.0 Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Transportation Technology.
04.0 Demonstrate an understanding of the characteristics and scope of technology.
05.0 Demonstrate an understanding of the core concepts of technology.
06.0 Demonstrate an understanding of the relationships among technologies and the connection between technology and other fields of study.
07.0 Demonstrate an understanding of the cultural, social, economic, and political effects of technology.
08.0 Demonstrate an understanding of the effects of technology on the environment.
09.0 Demonstrate an understanding of the role of society in the development and use of technology.
10.0 Demonstrate an understanding of the influence of technology on history.
11.0 Demonstrate an understanding of the attributes of design.
12.0 Demonstrate an understanding of engineering design.
13.0 Demonstrate an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving.
14.0 Demonstrate the abilities to apply the design process.
15.0 Demonstrate the abilities to use and maintain technological products and systems.
16.0 Demonstrate the abilities to assess the impact of products and systems.
17.0 Demonstrate an understanding of and be able to select and use energy and power technologies.
18.0 Demonstrate an understanding of and be able to select and use transportation technologies.
19.0 Demonstrate safe and appropriate use of tools, machines, and materials in transportation technology.
20.0 Demonstrate technical knowledge and skills about steam-powered vehicles.
21.0 Demonstrate technical knowledge and skills about diesel engine power technology.
22.0 Demonstrate technical knowledge and skills about internal combustion power technology.
23.0 Demonstrate technical knowledge and skills about hydraulic and pneumatic power technology.
24.0 Demonstrate technical knowledge and skills about electric-powered vehicles.
25.0 Demonstrate technical knowledge and skills about jet engine power technology.
26.0 Demonstrate technical knowledge and skills about rocket engine power technology.
27.0 Demonstrate technical knowledge and skills about solar cells and fuel cells.
28.0 Demonstrate technical knowledge and skills about human-powered vehicles.
29.0 Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Transportation Technology.
30.0 Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Transportation Technology.
31.0 Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Transportation Technology.

32.0 Perform advanced-study and technical skills related to energy and power technology.
33.0 Demonstrate technical knowledge and skills about powered transportation systems.
34.0 Conduct a research and experimentation project on an energy and power system.
35.0 Demonstrate an understanding of career opportunities and requirements in the field of transportation technology.

Florida Department of Education
Student Performance Standards

Course Title: **Transportation Technology I**
Course Number: **8601210**
Course Credit: **1**

Course Description:
This course provides students with an introduction to the knowledge, human relations, and technical skills of transportation technology.

Florida Standards			Correlation to CTE Program Standard #
01.0	Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Transportation Technology.		
	01.01 Key Ideas and Details		
	01.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. LAFS.910.RST.1.1	
	01.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.910.RST.1.2	
	01.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.910.RST.1.3	
	01.02 Craft and Structure		
	01.02.1	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. LAFS.910.RST.2.4	
	01.02.2	Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). LAFS.910.RST.2.5	
	01.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. LAFS.910.RST.2.6	

Florida Standards			Correlation to CTE Program Standard #
01.03	Integration of Knowledge and Ideas		
	01.03.1	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. LAFS.910.RST.3.7	
	01.03.2	Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. LAFS.910.RST.3.8	
	01.03.3	Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. LAFS.910.RST.3.9	
01.04	Range of Reading and Level of Text Complexity		
	01.04.1	By the end of grade 9, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	01.04.2	By the end of grade 10, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 9–10 text complexity band independently and proficiently. LAFS.910.RST.4.10	
02.0	Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Transportation Technology.		
02.01	Text Types and Purposes		
	02.01.1	Write arguments focused on discipline-specific content. LAFS.910.WHST.1.1	
	02.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.910.WHST.1.2	
02.02	Production and Distribution of Writing		
	02.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.910.WHST.2.4	
	02.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.910.WHST.2.5	

Florida Standards			Correlation to CTE Program Standard #
	02.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. LAFS.910.WHST.2.6	
02.03	Research to Build and Present Knowledge		
	02.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.910.WHST.3.7	
	02.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. LAFS.910.WHST.3.8	
	02.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.910.WHST.3.9	
02.04	Range of Writing		
	02.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.910.WHST.4.10	
03.0	Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Transportation Technology.		
03.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1		
03.02	Reason abstractly and quantitatively. MAFS.K12.MP.2.1		
03.03	Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1		
03.04	Model with mathematics. MAFS.K12.MP.4.1		
03.05	Use appropriate tools strategically. MAFS.K12.MP.5.1		

Florida Standards	Correlation to CTE Program Standard #
03.06 Attend to precision. MAFS.K12.MP.6.1	
03.07 Look for and make use of structure. MAFS.K12.MP.7.1	
03.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
04.0	Demonstrate an understanding of the characteristics and scope of technology. – The student will be able to:		
04.01	Discuss the nature and development of technological knowledge and processes.		
04.02	Conduct specific goal-directed research related to inventions and innovations.		
05.0	Demonstrate an understanding of the core concepts of technology. – The student will be able to:		
05.01	Identify systems thinking logic and creativity with appropriate compromises in complex real-life problems.		
05.02	Define technological systems, which are the building blocks of technology and are embedded within larger technological, social, and environmental systems.		
05.03	Identify resources involving trade-offs between competing values, such as availability, cost, desirability, and waste.		
05.04	Identify the criteria and constraints of a product or system and determine how they affect the final design and development.		
05.05	Define a management system as the process of planning, organizing, and controlling work.		
07.0	Demonstrate an understanding of the cultural, social, economic, and political effects of technology. – The student will be able to:		
07.01	Identify changes caused by the use of technology ranging from gradual to rapid and from subtle to obvious.		
07.02	Classify the use of technology involving weighing the trade-offs between the positive and the negative effects.		
08.0	Demonstrate an understanding of the effects of technology on the environment. – The student will be able to:		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	08.01 Identify technologies devised to reduce the negative consequences of other technologies.		
	08.02 Discuss the implementation of technologies involving the weighing of trade-offs between predicted positive and negative effects on the environment.		
10.0	Demonstrate an understanding of the influence of technology on history. – The student will be able to:		
	10.01 Research how the evolution of civilization has been directly affected by, and has in turn affected, the development and use of tools and materials.		
	10.02 Define the history of technology as a powerful force in reshaping the social, cultural, political, and economic landscape.		
11.0	Demonstrate an understanding of the attributes of design. – The student will be able to:		
	11.01 Recognize the design process; including defining a problem, brainstorming, researching and generating ideas, identifying criteria and specifying constraints, exploring possibilities, selecting an approach, developing a design proposal, making a model or prototype, testing and evaluating the design using specifications, refining the design, creating or making it, and communicating processes and results.		
	11.02 Restate design problems that are seldom presented in a clearly defined form.		
	11.03 Check and critique a design continually, and improve and revise the idea of the design as needed.		
	11.04 List competing requirements of a design, such as criteria, constraints, and efficiency.		
12.0	Demonstrate an understanding of engineering design. – The student will be able to:		
	12.01 Identify design principles used to evaluate existing designs, to collect data, and to guide the design process.		
	12.02 Describe the influence of personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly on the Engineering Design process.		
	12.03 Construct a prototype or a working model used to test a design concept by making actual observations and necessary adjustments.		
	12.04 Identify factors taken into account in the process of engineering.		
13.0	Demonstrate an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving. – The student will be able to:		
	13.01 Define research and development as a specific problem solving approach that is used intensively in business and industry to prepare devices and systems for the marketplace.		
	13.02 Identify research needed to solve technological problems.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
13.03	Differentiate between technological and non-technological problems, and identify which problems can be solved using technology.		
13.04	Utilize a multidisciplinary approach to solving technological problems.		
14.0	Demonstrate the abilities to apply the design process. – The student will be able to:		
14.01	Identify the design problem to solve and decide whether or not to address it.		
14.02	List criteria and constraints and determine how these will affect the design process.		
14.03	Refine a design by using prototypes and modeling to ensure quality, efficiency, and productivity of the final product.		
14.04	Evaluate the design solution using conceptual, physical, and mathematical models at various intervals of the design process in order to check for proper design and to note areas where improvements are needed.		
14.05	Develop a product or system using a design process.		
14.06	Evaluate final solutions and communicate observations, processes, and results of the entire design process, using verbal, graphic, quantitative, virtual, and written means, in addition to three-dimensional models.		
15.0	Demonstrate the abilities to use and maintain technological products and systems. – The student will be able to:		
15.01	Document processes and procedures and communicate them to different audiences using appropriate oral and written techniques.		
15.02	Diagnose a system that is malfunctioning and use tools, materials, machines, and knowledge to repair it.		
15.03	Troubleshoot, analyze, and maintain systems to ensure safe and proper function and precision.		
15.04	Operate systems so that they function in the way they were designed.		
15.05	Use computers and calculators to access, retrieve, organize, process, maintain, interpret, and evaluate data and information in order to communicate.		
16.0	Demonstrate the abilities to assess the impact of products and systems. – The student will be able to:		
16.01	Collect information and evaluate its quality.		
16.02	Synthesize data, analyze trends, and draw conclusions regarding the effect of technology on the individual, society, and the environment.		
16.03	Define assessment techniques, such as trend analysis and experimentation to make decisions about the future development of technology.		
16.04	Identify forecasting techniques to evaluate the results of altering natural systems.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
17.0	Demonstrate an understanding of and be able to select and use energy and power technologies. – The student will be able to:		
17.01	Explain impossibility of building an engine to perform work that does not exhaust thermal energy to the surroundings.		
17.02	Construct a power system having a source of energy, a process, and loads.		
18.0	Demonstrate an understanding of and be able to select and use transportation technologies. – The student will be able to:		
18.01	Analyze the vital role played by transportation in the operation of other technologies, such as manufacturing, construction, communication, health and safety, and agriculture.		
18.02	Define intermodalism as the use of different modes of transportation, such as highways, railways, and waterways as part of an interconnected system that can move people and goods easily from one mode to another.		
18.03	Discuss how transportation services and methods have led to a population that is regularly on the move.		
18.04	Identify processes and innovative techniques involved in the design of intelligent and non-intelligent transportation systems.		
19.0	Demonstrate safe and appropriate use of tools, machines, and materials in transportation technology. – The student will be able to:		
19.01	Select appropriate tools, procedures, and/or equipment.		
19.02	Demonstrate the safe usage of appropriate tools, procedures, and operation of equipment.		
19.03	Follow laboratory safety rules and procedures.		
19.04	Demonstrate good housekeeping at workstation within total laboratory.		
19.05	Identify color-coding safety standards.		
19.06	Explain fire prevention and safety precautions and practices for extinguishing fires.		
19.07	Identify harmful effects/potential dangers of familiar hazardous substances/devices to people and the environment.		
20.0	Demonstrate technical knowledge and skills about steam-powered vehicles. – The student will be able to:		
20.01	Identify and define the key terms, categories, and parts of steam-powered engine.		
20.02	Describe the operating theory and principles of steam engines and steam turbines.		
20.03	Explain the uses and applications of steam power engines and systems.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	20.04 Describe energy and fuel sources for steam power operations.		
	20.05 Perform technical skills in building, assembling, maintaining, or operating a steam-powered vehicle.		
21.0	Demonstrate technical knowledge and skills about diesel engine power technology. – The student will be able to:		
	21.01 Identify and define key terms, categories, and parts of diesel engine power technology.		
	21.02 Describe the operating theory and principles of diesel engine power technology.		
	21.03 Explain the uses and applications of diesel engines.		
	21.04 Identify industries that produce and use diesel engines.		
	21.05 Describe energy and fuel sources for diesel engines.		
	21.06 Perform technical skills in building, assembling, maintaining, or operating diesel engines.		
22.0	Demonstrate technical knowledge and skills about internal combustion power technology. – The student will be able to:		
	22.01 Identify and define the key terms, categories, and parts of gasoline engine internal combustion technology.		
	22.02 Describe the operating theory and principles of internal combustion gasoline engines.		
	22.03 Explain the uses and applications of internal combustion gasoline engines.		
	22.04 Identify industries that produce and use internal combustion gasoline engines.		
	22.05 Describe energy and fuel sources for internal combustion gasoline engines.		
	22.06 Perform technical skills in building, assembling, maintaining, or operating internal combustion gasoline engines.		

Florida Department of Education
Student Performance Standards

Course Title: **Transportation Technology II**
Course Number: **8601220**
Course Credit: **1**

Course Description:
This course provides students with an intermediate understanding of the knowledge, human relations, and technical skills of transportation technology.

Florida Standards			Correlation to CTE Program Standard #
01.0	Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Transportation Technology.		
	01.01 Key Ideas and Details		
	01.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. LAFS.910.RST.1.1	
	01.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.910.RST.1.2	
	01.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.910.RST.1.3	
	01.02 Craft and Structure		
	01.02.1	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. LAFS.910.RST.2.4	
	01.02.2	Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). LAFS.910.RST.2.5	
	01.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. LAFS.910.RST.2.6	

Florida Standards			Correlation to CTE Program Standard #
01.03	Integration of Knowledge and Ideas		
	01.03.1	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. LAFS.910.RST.3.7	
	01.03.2	Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. LAFS.910.RST.3.8	
	01.03.3	Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. LAFS.910.RST.3.9	
01.04	Range of Reading and Level of Text Complexity		
	01.04.1	By the end of grade 9, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	01.04.2	By the end of grade 10, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 9–10 text complexity band independently and proficiently. LAFS.910.RST.4.10	
02.0	Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Transportation Technology.		
02.01	Text Types and Purposes		
	02.01.1	Write arguments focused on discipline-specific content. LAFS.910.WHST.1.1	
	02.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.910.WHST.1.2	
02.02	Production and Distribution of Writing		
	02.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.910.WHST.2.4	
	02.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.910.WHST.2.5	

Florida Standards			Correlation to CTE Program Standard #
	02.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. LAFS.910.WHST.2.6	
02.03	Research to Build and Present Knowledge		
	02.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.910.WHST.3.7	
	02.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. LAFS.910.WHST.3.8	
	02.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.910.WHST.3.9	
02.04	Range of Writing		
	02.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.910.WHST.4.10	
03.0	Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Transportation Technology.		
03.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1		
03.02	Reason abstractly and quantitatively. MAFS.K12.MP.2.1		
03.03	Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1		
03.04	Model with mathematics. MAFS.K12.MP.4.1		
03.05	Use appropriate tools strategically. MAFS.K12.MP.5.1		

Florida Standards	Correlation to CTE Program Standard #
03.06 Attend to precision. MAFS.K12.MP.6.1	
03.07 Look for and make use of structure. MAFS.K12.MP.7.1	
03.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
04.0	Demonstrate an understanding of the characteristics and scope of technology. – The student will be able to:		
04.01	Illustrate the nature and development of technological knowledge and processes.		
04.02	Graph the rapid increase in the rate of technological development and diffusion.		
04.03	Conduct specific goal-directed research related to inventions and innovations.		
05.0	Demonstrate an understanding of the core concepts of technology. – The student will be able to:		
05.01	Apply systems thinking logic and creativity with appropriate compromises in complex real-life problems.		
05.02	Discuss technological systems, which are the building blocks of technology and are embedded within larger technological, social, and environmental systems.		
05.03	Select resources involving trade-offs between competing values, such as availability, cost, desirability, and waste.		
05.04	Identify the criteria and constraints of a product or system and then determine how they affect the final design and development.		
05.05	Discuss new technologies that create new processes.		
05.06	Organize a management system as the process of planning, organizing, and controlling work.		
07.0	Demonstrate an understanding of the cultural, social, economic, and political effects of technology. – The student will be able to:		
07.01	Discuss changes caused by the use of technology ranging from gradual to rapid and from subtle to obvious.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	07.02 Compare the use of technology involving weighing the trade-offs between the positive and the negative effects.		
	07.03 Debate the cultural, social, economic, and political changes caused by the transfer of a technology from one society to another.		
09.0	Demonstrate an understanding of the role of society in the development and use of technology. – The student will be able to:		
	09.01 Report how different cultures develop their own technologies to satisfy their individual and shared needs, wants, and values.		
	09.02 Consider societal opinions and demands, as well as corporate cultures to use as a basis for deciding whether or not to develop a technology.		
	09.03 Consider a number of different factors, such as advertising, the strength of the economy, the goals of a company, and the latest fads as contributors to shaping the design of and demand for various technologies.		
10.0	Demonstrate an understanding of the influence of technology on history. – The student will be able to:		
	10.01 Research the history of technology as a powerful force in reshaping the social, cultural, political, and economic landscape.		
	10.02 Debate that early in the history of technology, the development of many tools and machines was based not on scientific knowledge but on technological know-how.		
	10.03 Discuss the Iron Age as the use of iron and steel as the primary materials for tools.		
	10.04 Discuss the Middle Ages and its development of many technological devices that produced long-lasting effects on technology and society.		
	10.05 Discuss the Renaissance, a time of rebirth of the arts and humanities, as an important development in the history of technology.		
	10.06 Discuss the Industrial Revolution and the development of continuous manufacturing, sophisticated transportation and communication systems, advanced construction practices, and improved education and leisure time.		
	10.07 Discuss the Information Age and its placement of emphasis on the processing and exchange of information.		
11.0	Demonstrate an understanding of the attributes of design. – The student will be able to:		
	11.01 Describe the design process; including defining a problem, brainstorming, researching and generating ideas, identifying criteria and specifying constraints, exploring possibilities, selecting an approach, developing a design proposal, making a model or prototype, testing and evaluating the design using specifications, refining the design, creating or making it, and communicating processes and results.		
	11.02 Translate design problems that are seldom presented in a clearly defined form.		
	11.03 Evaluate a design continually, and improve and revise the idea of the design as needed.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
11.04	Analyze competing requirements of a design, such as criteria, constraints, and efficiency.		
12.0	Demonstrate an understanding of engineering design. – The student will be able to:		
12.01	Investigate design principles used to evaluate existing designs, to collect data, and to guide the design process.		
12.02	Examine the influence of personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly on the Engineering Design process.		
12.03	Construct a prototype or a working model used to test a design concept by making actual observations and necessary adjustments.		
12.04	Evaluate factors taken into account in the process of engineering.		
13.0	Demonstrate an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving. – The student will be able to:		
13.01	Employ research and development as a specific problem solving approach that is used intensively in business and industry to prepare devices and systems for the marketplace.		
13.02	Conduct research needed to solve technological problems.		
13.03	Differentiate between technological and non-technological problems, and identify which problems can be solved using technology.		
13.04	Utilize a multidisciplinary approach to solving technological problems.		
14.0	Demonstrate the abilities to apply the design process. – The student will be able to:		
14.01	Interpret the design problem to solve and decide whether or not to address it.		
14.02	Evaluate criteria and constraints and determine how these will affect the design process.		
14.03	Refine a design by using prototypes and modeling to ensure quality, efficiency, and productivity of the final product.		
14.04	Evaluate the design solution using conceptual, physical, and mathematical models at various intervals of the design process in order to check for proper design and to note areas where improvements are needed.		
14.05	(Develop, Produce) a product or system using a design process.		
14.06	Evaluate final solutions and communicate observations, processes, and results of the entire design process, using verbal, graphic, quantitative, virtual, and written means, in addition to three-dimensional models.		
15.0	Demonstrate the abilities to use and maintain technological products and systems. – The student will be able to:		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
15.01	Document processes and procedures and communicate them to different audiences using appropriate oral and written techniques.		
15.02	Diagnose a system that is malfunctioning and use tools, materials, machines, and knowledge to repair it.		
15.03	Troubleshoot, analyze, and maintain systems to ensure safe and proper function and precision.		
15.04	Operate systems so that they function in the way they were designed.		
15.05	Use computers and calculators to access, retrieve, organize, process, maintain, interpret, and evaluate data and information in order to communicate.		
16.0	Demonstrate the abilities to assess the impact of products and systems. – The student will be able to:		
16.01	Collect information and evaluate its quality.		
16.02	Synthesize data, analyze trends, and draw conclusions regarding the effect of technology on the individual, society, and the environment.		
16.03	Apply assessment techniques, such as trend analysis and experimentation to make decisions about the future development of technology.		
16.04	Design forecasting techniques to evaluate the results of altering natural systems.		
17.0	Demonstrate an understanding of and be able to select and use energy and power technologies. – The student will be able to:		
17.01	Explain impossibility of building an engine to perform work that does not exhaust thermal energy to the surroundings.		
17.02	Construct a power system having a source of energy, a process, and loads.		
18.0	Demonstrate an understanding of and be able to select and use transportation technologies. – The student will be able to:		
18.01	Analyze the vital role played by transportation in the operation of other technologies, such as manufacturing, construction, communication, health and safety, and agriculture.		
18.02	Define intermodalism as the use of different modes of transportation, such as highways, railways, and waterways as part of an interconnected system that can move people and goods easily from one mode to another.		
18.03	Discuss how transportation services and methods have led to a population that is regularly on the move.		
18.04	Identify processes and innovative techniques involved in the design of intelligent and non-intelligent transportation systems.		
19.0	Demonstrate safe and appropriate use of tools, machines, and materials in transportation technology. – The student will be able to:		
19.01	Select appropriate tools, procedures, and/or equipment.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	19.02 Demonstrate the safe usage of appropriate tools, procedures, and operation of equipment.		
	19.03 Follow laboratory safety rules and procedures.		
	19.04 Demonstrate good housekeeping at workstation within total laboratory.		
	19.05 Identify color-coding safety standards.		
	19.06 Explain fire prevention and safety precautions and practices for extinguishing fires.		
	19.07 Identify harmful effects/potential dangers of familiar hazardous substances/devices to people and the environment.		
23.0	Demonstrate technical knowledge and skills about hydraulic and pneumatic power technology. – The student will be able to:		
	23.01 Identify and define key terms, categories, and parts of hydraulic and pneumatic power technology.		
	23.02 Describe the operating theory and principles of hydraulic and pneumatic power technology.		
	23.03 Explain the uses and applications of hydraulic and pneumatic power systems.		
	23.04 Identify industries that produce and use hydraulic and pneumatic power systems.		
	23.05 Describe the energy sources for hydraulic and pneumatic power systems.		
	23.06 Perform technical skills in building, assembling, maintaining, or operating hydraulic and pneumatic power systems.		
24.0	Demonstrate technical knowledge and skills about electric-powered vehicles. – The student will be able to:		
	24.01 Identify and define the key terms, categories, and parts of an electric-powered vehicle.		
	24.02 Describe the operating theory and principles of electric-powered vehicle systems.		
	24.03 Explain the uses and applications of electric-powered vehicles.		
	24.04 Describe energy and fuel sources for electric-powered vehicles.		
	24.05 Perform technical skills in building, assembling, maintaining, or operating an electric-powered vehicle.		
25.0	Demonstrate technical knowledge and skills about jet engine power technology. – The student will be able to:		
	25.01 Identify and define key terms, categories, and parts of jet engine power technology.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	25.02 Describe the operating theory and principles of jet engine power technology.		
	25.03 Explain the uses and applications of jet engines.		
	25.04 Identify industries that produce and use jet engines.		
	25.05 Describe energy and fuel sources for jet engines.		
	25.06 Perform technical skills in building, assembling, maintaining, or operating jet engines.		
26.0	Demonstrate technical knowledge and skills about rocket engine power technology. – The student will be able to:		
	26.01 Identify and define key terms, categories, and parts of rocket engine power technology.		
	26.02 Describe the operating theory and principles of rocket engine power technology.		
	26.03 Explain the uses and applications of rocket engines.		
	26.04 Identify industries that produce and use rocket engines.		
	26.05 Describe energy and fuel sources for rocket engines.		
	26.06 Perform technical skills in building, assembling, maintaining, or operating rocket engines.		
27.0	Demonstrate technical knowledge and skills about solar cells and fuel cells. – The student will be able to:		
	27.01 Identify and define key terms, categories, and parts of solar cell and fuel cell power technology.		
	27.02 Describe the operating theory and principles of solar cell and fuel cell power technology.		
	27.03 Explain the uses and applications of solar cell and fuel cell power technology.		
	27.04 Identify the industries that produce and use solar cell and fuel cell power systems.		
	27.05 Describe the energy and fuel sources for solar cell and fuel cell power systems.		
	27.06 Perform technical skills in building, assembling, maintaining, or operating solar cell or fuel cell systems.		
28.0	Demonstrate technical knowledge and skills about human-powered vehicles. – The student will be able to:		
	28.01 Identify and define the key terms, categories, and parts of human-powered vehicles.		
	28.02 Describe the operating theory and principles of human-powered systems.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
28.03	Explain the uses and applications of human-powered vehicles.		
28.04	Perform technical skills in building, assembling, maintaining, or operating a simulated or real human-powered vehicle.		

Florida Department of Education
Student Performance Standards

Course Title: **Transportation Technology III**
Course Number: **8601230**
Course Credit: **1**

Course Description:
This course provides students with an advanced understanding of the knowledge, human relations, and technical skills of energy and power technology.

Florida Standards			Correlation to CTE Program Standard #
29.0	Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Transportation Technology.		
	29.01 Key Ideas and Details		
	29.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. LAFS.1112.RST.1.1	
	29.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.1112.RST.1.2	
	29.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.1112.RST.1.3	
	29.02 Craft and Structure		
	29.02.1	Determine the meaning of symbols key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. LAFS.1112.RST.2.4	
	29.02.2	Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. LAFS.1112.RST.2.5	
	29.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. LAFS.1112.RST.2.6	

Florida Standards			Correlation to CTE Program Standard #
29.03	Integration of Knowledge and Ideas		
	29.03.1	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g. quantitative data, video, multimedia) in order to address a question or solve a problem. LAFS.1112.RST.3.7	
	29.03.2	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. LAFS.1112.RST.3.8	
	29.03.3	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. LAFS.1112.RST.3.9	
29.04	Range of Reading and Level of Text Complexity		
	29.04.1	By the end of grade 11, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	29.04.2	By the end of grade 12, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 11–CCR text complexity band independently and proficiently. LAFS.1112.RST.4.10	
30.0	Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Transportation Technology.		
30.01	Text Types and Purposes		
	30.01.1	Write arguments focused on discipline-specific content. LAFS.1112.WHST.1.1	
	30.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.1112.WHST.1.2	
30.02	Production and Distribution of Writing		
	30.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.1112.WHST.2.4	

Florida Standards		Correlation to CTE Program Standard #
30.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.1112.WHST.2.5	
30.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. LAFS.1112.WHST.2.6	
30.03	Research to Build and Present Knowledge	
30.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.1112.WHST.3.7	
30.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. LAFS.1112.WHST.3.8	
30.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.1112.WHST.3.9	
30.04	Range of Writing	
30.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.1112.WHST.4.10	
Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Transportation Technology.		
30.05	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	
30.06	Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
30.07	Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	

Florida Standards	Correlation to CTE Program Standard #
30.08 Model with mathematics. MAFS.K12.MP.4.1	
30.09 Use appropriate tools strategically. MAFS.K12.MP.5.1	
30.10 Attend to precision. MAFS.K12.MP.6.1	
30.11 Look for and make use of structure. MAFS.K12.MP.7.1	
30.12 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
04.0 Demonstrate an understanding of the characteristics and scope of technology. – The student will be able to:		
04.01 Graph the rapid increase in the rate of technological development and diffusion.		
04.02 Conduct specific goal-directed research related to inventions and innovations.		
05.0 Demonstrate an understanding of the core concepts of technology. – The student will be able to:		
05.01 Apply systems thinking logic and creativity with appropriate compromises in complex real-life problems.		
05.02 Assess technological systems, which are the building blocks of technology and are embedded within larger technological, social, and environmental systems.		
05.03 Assess the stability of a technological system and its influence by all of the components in the system, especially those in the feedback loop.		
05.04 Compare resources involving trade-offs between competing values, such as availability, cost, desirability, and waste.		
05.05 Identify the criteria and constraints of a product or system and determine how they affect the final design and development.		
05.06 Recommend a quality control process to ensure that a product, service or system meets established criteria.		
05.07 Organize a management system as the process of planning, organizing, and controlling work.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
06.0	Demonstrate an understanding of the relationships among technologies and the connection between technology and other fields of study. – The student will be able to:		
06.01	Report the process of patenting to protect a technological idea.		
06.02	Investigate technological progresses that promote the advancement of science and mathematics.		
07.0	Demonstrate an understanding of the cultural, social, economic, and political effects of technology. – The student will be able to:		
07.01	Discuss changes caused by the use of technology ranging from gradual to rapid and from subtle to obvious.		
07.02	Evaluate the use of technology involving weighing the trade-offs between the positive and the negative effects.		
07.03	Discuss ethical considerations important in the development, selection, and use of technologies.		
07.04	Debate the cultural, social, economic, and political changes caused by the transfer of a technology from one society to another.		
09.0	Demonstrate an understanding of the role of society in the development and use of technology. – The student will be able to:		
09.01	Report how different cultures develop their own technologies to satisfy their individual and shared needs, wants, and values.		
09.02	Consider societal opinions and demands, as well as corporate cultures to use as a basis for deciding whether or not to develop a technology.		
09.03	Evaluate a number of different factors, such as advertising, the strength of the economy, the goals of a company, and the latest fads as contributors to shaping the design of and demand for various technologies.		
11.0	Demonstrate an understanding of the attributes of design. – The student will be able to:		
11.01	Implement the design process; including defining a problem, brainstorming, researching and generating ideas, identifying criteria and specifying constraints, exploring possibilities, selecting an approach, developing a design proposal, making a model or prototype, testing and evaluating the design using specifications, refining the design, creating or making it, and communicating processes and results.		
11.02	Translate design problems that are seldom presented in a clearly defined form.		
11.03	Evaluate a design continually, and improve and revise the idea of the design as needed.		
11.04	Analyze competing requirements of a design, such as criteria, constraints, and efficiency.		
12.0	Demonstrate an understanding of engineering design. – The student will be able to:		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
12.01	Select design principles used to evaluate existing designs, to collect data, and to guide the design process.		
12.02	Examine the influence of personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly on the Engineering Design process.		
12.03	Construct a prototype or a working model used to test a design concept by making actual observations and necessary adjustments.		
12.04	Evaluate factors taken into account in the process of engineering.		
13.0	Demonstrate an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving. – The student will be able to:		
13.01	Employ research and development as a specific problem solving approach that is used intensively in business and industry to prepare devices and systems for the marketplace.		
13.02	Conduct research needed to solve technological problems.		
13.03	Differentiate between technological and non-technological problems, and identify which problems can be solved using technology.		
13.04	Utilize a multidisciplinary approach to solving technological problems.		
14.0	Demonstrate the abilities to apply the design process. – The student will be able to:		
14.01	Interpret the design problem to solve and decide whether or not to address it.		
14.02	Evaluate criteria and constraints and determine how these will affect the design process.		
14.03	Refine a design by using prototypes and modeling to ensure quality, efficiency, and productivity of the final product.		
14.04	Evaluate the design solution using conceptual, physical, and mathematical models at various intervals of the design process in order to check for proper design and to note areas where improvements are needed.		
14.05	Produce a product or system using a design process.		
14.06	Evaluate final solutions and communicate observations, processes, and results of the entire design process, using verbal, graphic, quantitative, virtual, and written means, in addition to three-dimensional models.		
15.0	Demonstrate the abilities to use and maintain technological products and systems. – The student will be able to:		
15.01	Document processes and procedures and communicate them to different audiences using appropriate oral and written techniques.		
15.02	Diagnose a system that is malfunctioning and use tools, materials, machines, and knowledge to repair it.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	15.03 Troubleshoot, analyze, and maintain systems to ensure safe and proper function and precision.		
	15.04 Operate systems so that they function in the way they were designed.		
	15.05 Use computers and calculators to access, retrieve, organize, process, maintain, interpret, and evaluate data and information in order to communicate.		
16.0	Demonstrate the abilities to assess the impact of products and systems. – The student will be able to:		
	16.01 Collect information and evaluate its quality.		
	16.02 Synthesize data, analyze trends, and draw conclusions regarding the effect of technology on the individual, society, and the environment.		
	16.03 Apply assessment techniques, such as trend analysis and experimentation to make decisions about the future development of technology.		
	16.04 Design forecasting techniques to evaluate the results of altering natural systems.		
18.0	Demonstrate an understanding of and be able to select and use transportation technologies. – The student will be able to:		
	18.01 Analyze the vital role played by transportation in the operation of other technologies, such as manufacturing, construction, communication, health and safety, and agriculture.		
	18.02 Define intermodalism as the use of different modes of transportation, such as highways, railways, and waterways as part of an interconnected system that can move people and goods easily from one mode to another.		
	18.03 Discuss how transportation services and methods have led to a population that is regularly on the move.		
	18.04 Identify processes and innovative techniques involved in the design of intelligent and non-intelligent transportation systems.		
19.0	Demonstrate safe and appropriate use of tools, machines, and materials in transportation technology. – The student will be able to:		
	19.01 Select appropriate tools, procedures, and/or equipment.		
	19.02 Demonstrate the safe usage of appropriate tools, procedures, and operation of equipment.		
	19.03 Follow laboratory safety rules and procedures.		
	19.04 Demonstrate good housekeeping at workstation within total laboratory.		
	19.05 Identify color-coding safety standards.		
	19.06 Explain fire prevention and safety precautions and practices for extinguishing fires.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	19.07 Identify harmful effects/potential dangers of familiar hazardous substances/devices to people and the environment.		
32.0	Perform advanced-study and technical skills related to energy and power technology. – The student will be able to:		
	32.01 Select an individual or group project in cooperation with the teacher.		
	32.02 Develop a written plan of work to carry out the project.		
	32.03 Show evidence of technical study in support of the project.		
	32.04 Perform skills related to the project.		
	32.05 Complete the project as planned.		
33.0	Demonstrate technical knowledge and skills about powered transportation systems. – The student will be able to:		
	33.01 Identify and define key terms, categories, and parts of land, water, air, and space transportation systems.		
	33.02 Describe the theories and operating principles of land, water, air, and space transportation.		
	33.03 Explain the uses and applications of land, water, air and space transportation vehicles.		
	33.04 Identify industries that produce and use land, water, air, and space transportation vehicles.		
	33.05 Describe the energy and power systems used in land, water, air, and space vehicles.		
	33.06 Perform technical skills in building, assembling, servicing, or operating a complete transportation vehicle.		
34.0	Conduct a research and experimentation project on an energy and power system. – The student will be able to:		
	34.01 Identify a problem.		
	34.02 State a need to research the problem.		
	34.03 Form a hypothesis about the problem.		
	34.04 Plan the procedures for researching the problem.		
	34.05 Conduct the research following the planned procedures.		
	34.06 Present the research findings in a seminar.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
35.0	Demonstrate an understanding of career opportunities and requirements in the field of transportation technology. – The student will be able to:		
35.01	Discuss individual interests related to a career in transportation technology.		
35.02	Explore career opportunities related to a career in transportation technology.		
35.03	Explore secondary education opportunities related to transportation technology.		
35.04	Conduct a job search.		
35.05	Complete a job application form correctly.		
35.06	Demonstrate competence in job interview techniques.		
35.07	Create a professional resume and letter of introduction.		
35.08	Solicit awards, letters of recommendation and recognition.		
35.09	Organize work samples in a professional, presentable format.		

Additional Information

Laboratory Activities

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

Career and Technical Student Organization (CTSO)

The Florida Technology Student Association (FL-TSA) is the intercurricular career and technical student organization for providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

Cooperative Training – OJT

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

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 Occupational Completion Point (OCP) or a Modified Occupational Completion Point (MOCP). If needed, a student may enroll in the same career and technical course more than once. Documentation should be included in the IEP that clearly indicates that it is anticipated that the student may need an additional year to complete an OCP/MOCP. The student should work on different competencies and new applications of competencies each year toward completion of the OCP/MOCP. After achieving the competencies identified for the year, the student earns credit for the course. It is important to ensure that credits earned by students are reported accurately. The district's information system must be designed to accept multiple credits for the same course number for eligible students with disabilities.

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

Florida Department of Education
Curriculum Framework

Program Title: **Power and Energy Technology**
Program Type: **Non Career Preparatory**
Career Cluster: **Engineering & Technology Education**

Secondary – Non Career Preparatory	
Program Number	8601300
CIP Number	0821010501
Grade Level	9-12; 30, 31
Standard Length	3 credits
Teacher Certification	TEC ED 1 @2 ENG @7 7G AUTO MECH @7 7G TEC MECH %7G DIESEL MECH @7 7G GASENG RPR @7 7G AUTO IND @7 %7G TRANSPORT @4 @7 7G AIR MECH @7 7G
CTSO	Florida Technology Student Association (FL-TSA)
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 power and energy technology. 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, a study of power systems and the kinds and sources of energy. The content and activities will also include the study of entrepreneurship, safety, and leadership skills.

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

Program Structure

This program is a planned sequence of instruction consisting of three one-credit courses. The following table illustrates the program structure:

Course Number	Course Title	Length	Level	Graduation Requirement
8601310	Power and Energy Technology I	1 credit	2	VO
8601320	Power and Energy Technology II	1 credit	2	VO
8601330	Power and Energy Technology III	1 credit	3	VO

(Graduation Requirement Abbreviations- EQ= Equally Rigorous Science, PA= Practical Arts, EC= Economics, VO= Career and Technical Education)

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.

Academic Alignment Table

Academic alignment is an ongoing, collaborative effort of professional educators specializing in the fields of science, mathematics, English/language arts, and Career and Technical Education (CTE). This initiative supports CTE programs by improving student performance through the integration of academic content within CTE courses. Career and Technical Education courses that have been aligned to the Next Generation Sunshine State Standards for Science and the Florida Standards for Mathematics and English/Language Arts will show the following data: the quantity of academic standards in the CTE course; the total number of standards contained in the academic course; and the percentage of alignment to the CTE course.

Courses	Anatomy/ Physiology Honors	Astronomy Solar/Galactic Honors	Biology 1	Chemistry 1	Earth-Space Science	Environmental Science	Genetics	Integrated Science	Marine Science 1 Honors	Physical Science	Physics 1
8601310	#	1/80 1%	#	1/69 1%	1/67 1%	1/70 1%	#	1/82 1%	#	2/74 3%	2/72 3%
8601320	#	1/80 1%	#	1/69 1%	1/67 1%	1/70 1%	#	1/82 1%	#	2/74 3%	2/72 3%
8601330	#	1/80 1%	#	1/69 1%	1/67 1%	1/70 1%	#	1/82 1%	#	2/74 3%	2/72 3%

** *Alignment pending review* # *Alignment attempted, but no correlation to academic course*

Courses	Algebra 1	Algebra 2	Geometry	English 1	English 2	English 3	English 4
8601310	**	**	**	**	**	**	**
8601320	**	**	**	**	**	**	**

Courses	Algebra 1	Algebra 2	Geometry	English 1	English 2	English 3	English 4
8601330	**	**	**	**	**	**	**

** *Alignment pending review* # *Alignment attempted, but no correlation to academic course*

Florida Standards for Technical Subjects

Florida Standards (FS) for English Language Arts and Literacy in History/Social Studies, Science, and Technical Subjects are the critical reading and writing literacy standards designed for grade 6 and above. These standards are predicated on teachers of history/social studies, science, and technical subjects using their content area expertise to help students meet the particular challenges of reading, writing, speaking, listening, and language in their respective fields. It is important to note that the 6-12 literacy standards in history/social studies, science, and technical subjects are not meant to replace content standards in those areas but rather to supplement them.

This curriculum framework incorporates the grades 9-10 reading and writing literacy standards in the first two courses of this CTE program and grade 11-12 reading and writing literacy standards in the third and fourth courses of this CTE program. The standards for Mathematical Practices describe varieties of expertise that educators at all levels should seek to develop in their students. These practices rest on important "processes and proficiencies" with longstanding importance in mathematics education. This curriculum framework incorporates the appropriate mathematical practices in the first four courses of this CTE program.

Common Career Technical Core – Career Ready Practices

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

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

2. Apply appropriate academic and technical skills.

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

4. Communicate clearly, effectively and with reason.

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

6. Demonstrate creativity and innovation.

7. Employ valid and reliable research strategies.

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

9. Model integrity, ethical leadership and effective management.

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

11. Use technology to enhance productivity.

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

Standards

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

01.0 Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Power and Energy Technology.
02.0 Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Power and Energy Technology.
03.0 Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Power and Energy Technology.
04.0 Demonstrate an understanding of the characteristics and scope of technology.
05.0 Demonstrate an understanding of the core concepts of technology.
06.0 Demonstrate an understanding of the relationships among technologies and the connection between technology and other fields of study.
07.0 Demonstrate an understanding of the cultural, social, economic, and political effects of technology.
08.0 Demonstrate an understanding of the effects of technology on the environment.
09.0 Demonstrate an understanding of the influence of technology on history.
10.0 Demonstrate an understanding of the attributes of design.
11.0 Demonstrate an understanding of engineering design.
12.0 Demonstrate an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving.
13.0 Demonstrate the abilities to apply the design process.
14.0 Demonstrate the abilities to use and maintain technological products and systems.
15.0 Demonstrate the abilities to assess the impact of products and systems.
16.0 Demonstrate an understanding of and be able to select and use energy and power technologies.
17.0 Demonstrate safe and appropriate use of tools, machines, and materials in power and energy technology.
18.0 Describe sources of energy.
19.0 Demonstrate technical knowledge and skills related to power and energy systems.
20.0 Demonstrate technical knowledge and skills about steam power technology.
21.0 Demonstrate technical knowledge and skills about hydraulic and pneumatic power technology.
22.0 Demonstrate technical knowledge and skills about electric power technology.
23.0 Demonstrate technical knowledge and skills about solar cells and fuel cells.
24.0 Demonstrate technical knowledge and skills about nuclear power technology.
25.0 Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Power and Energy Technology.
26.0 Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Power and Energy Technology.
27.0 Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Power and Energy Technology.
28.0 Perform advanced-study and technical skills related to energy and power technology.
29.0 Measure and report the power and efficiency of power producing systems.
30.0 Conduct a research and experimentation project on an energy and power system.
31.0 Demonstrate an understanding of career opportunities and requirements in the field of power and energy technology.

Florida Department of Education
Student Performance Standards

Course Title: **Power and Energy Technology I**
Course Number: **8601310**
Course Credit: **1**

Course Description:
This course provides students with an introduction to the knowledge, human relations, and technical skills of energy and power technology.

Florida Standards			Correlation to CTE Program Standard #
01.0	Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Power and Energy Technology.		
	01.01 Key Ideas and Details		
	01.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. LAFS.910.RST.1.1	
	01.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.910.RST.1.2	
	01.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.910.RST.1.3	
	01.02 Craft and Structure		
	01.02.1	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. LAFS.910.RST.2.4	
	01.02.2	Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). LAFS.910.RST.2.5	
	01.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. LAFS.910.RST.2.6	

Florida Standards			Correlation to CTE Program Standard #
01.03	Integration of Knowledge and Ideas		
	01.03.1	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. LAFS.910.RST.3.7	
	01.03.2	Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. LAFS.910.RST.3.8	
	01.03.3	Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. LAFS.910.RST.3.9	
01.04	Range of Reading and Level of Text Complexity		
	01.04.1	By the end of grade 9, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	01.04.2	By the end of grade 10, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 9–10 text complexity band independently and proficiently. LAFS.910.RST.4.10	
02.0	Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Power and Energy Technology.		
02.01	Text Types and Purposes		
	02.01.1	Write arguments focused on discipline-specific content. LAFS.910.WHST.1.1	
	02.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.910.WHST.1.2	
02.02	Production and Distribution of Writing		
	02.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.910.WHST.2.4	
	02.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.910.WHST.2.5	

Florida Standards			Correlation to CTE Program Standard #
	02.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. LAFS.910.WHST.2.6	
02.03	Research to Build and Present Knowledge		
	02.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.910.WHST.3.7	
	02.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. LAFS.910.WHST.3.8	
	02.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.910.WHST.3.9	
02.04	Range of Writing		
	02.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.910.WHST.4.10	
03.0	Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Power and Energy Technology.		
03.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1		
03.02	Reason abstractly and quantitatively. MAFS.K12.MP.2.1		
03.03	Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1		
03.04	Model with mathematics. MAFS.K12.MP.4.1		
03.05	Use appropriate tools strategically. MAFS.K12.MP.5.1		

Florida Standards	Correlation to CTE Program Standard #
03.06 Attend to precision. MAFS.K12.MP.6.1	
03.07 Look for and make use of structure. MAFS.K12.MP.7.1	
03.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA.

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
04.0	Demonstrate an understanding of the characteristics and scope of technology. – The student will be able to:		
04.01	Discuss the nature and development of technological knowledge and processes.		
04.02	Conduct specific goal-directed research related to inventions and innovations.		
05.0	Demonstrate an understanding of the core concepts of technology. – The student will be able to:		
05.01	Identify systems thinking logic and creativity with appropriate compromises in complex real-life problems.		
05.02	Define technological systems, which are the building blocks of technology and are embedded within larger technological, social, and environmental systems.		
05.03	Identify resources involving trade-offs between competing values, such as availability, cost, desirability, and waste.		
05.04	Identify the criteria and constraints of a product or system and determine how they affect the final design and development.		
05.05	Define a management system as the process of planning, organizing, and controlling work.		
07.0	Demonstrate an understanding of the cultural, social, economic, and political effects of technology. – The student will be able to:		
07.01	Identify changes caused by the use of technology ranging from gradual to rapid and from subtle to obvious.		
07.02	Classify the use of technology involving weighing the trade-offs between the positive and the negative effects.		
08.0	Demonstrate an understanding of the effects of technology on the environment. – The student will be able to:		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
08.01	Identify technologies devised to reduce the negative consequences of other technologies.		
08.02	Discuss the implementation of technologies involving the weighing of trade-offs between predicted positive and negative effects on the environment.		
09.0	Demonstrate an understanding of the influence of technology on history. – The student will be able to:		
09.01	Research how the evolution of civilization has been directly affected by, and has in turn affected, the development and use of tools and materials.		
09.02	Define the history of technology as a powerful force in reshaping the social, cultural, political, and economic landscape.		
10.0	Demonstrate an understanding of the attributes of design. – The student will be able to:		SC.912.P.12.2
10.01	Recognize the design process; including defining a problem, brainstorming, researching and generating ideas, identifying criteria and specifying constraints, exploring possibilities, selecting an approach, developing a design proposal, making a model or prototype, testing and evaluating the design using specifications, refining the design, creating or making it, and communicating processes and results.		
10.02	Restate design problems that are seldom presented in a clearly defined form.		
10.03	Check and critique a design continually, and improve and revise the idea of the design as needed.		
10.04	List competing requirements of a design, such as criteria, constraints, and efficiency.		
11.0	Demonstrate an understanding of engineering design. – The student will be able to:		SC.912.P.12.2
11.01	Identify design principles used to evaluate existing designs, to collect data, and to guide the design process.		
11.02	Describe the influence of personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly on the Engineering Design process.		
11.03	Construct a prototype or a working model used to test a design concept by making actual observations and necessary adjustments.		
11.04	Identify factors taken into account in the process of engineering.		
12.0	Demonstrate an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving. – The student will be able to:		SC.912.P.12.2
12.01	Define research and development as a specific problem solving approach that is used intensively in business and industry to prepare devices and systems for the marketplace.		
12.02	Identify research needed to solve technological problems.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
12.03	Differentiate between technological and non-technological problems, and identify which problems can be solved using technology.		
12.04	Utilize a multidisciplinary approach to solving technological problems.		
13.0	Demonstrate the abilities to apply the design process. – The student will be able to:		SC.912.P.12.2
13.01	Identify the design problem to solve and decide whether or not to address it.		
13.02	List criteria and constraints and determine how these will affect the design process.		
13.03	Refine a design by using prototypes and modeling to ensure quality, efficiency, and productivity of the final product.		
13.04	Evaluate the design solution using conceptual, physical, and mathematical models at various intervals of the design process in order to check for proper design and to note areas where improvements are needed.		
13.05	Develop a product or system using a design process.		
13.06	Evaluate final solutions and communicate observations, processes, and results of the entire design process, using verbal, graphic, quantitative, virtual, and written means, in addition to three-dimensional models.		
14.0	Demonstrate the abilities to use and maintain technological products and systems. – The student will be able to:		SC.912.P.12.2
14.01	Document processes and procedures and communicate them to different audiences using appropriate oral and written techniques.		
14.02	Diagnose a system that is malfunctioning and use tools, materials, machines, and knowledge to repair it.		
14.03	Troubleshoot, analyze, and maintain systems to ensure safe and proper function and precision.		
14.04	Operate systems so that they function in the way they were designed.		
14.05	Use computers and calculators to access, retrieve, organize, process, maintain, interpret, and evaluate data and information in order to communicate.		
15.0	Demonstrate the abilities to assess the impact of products and systems. – The student will be able to:		SC.912.P.12.2
15.01	Collect information and evaluate its quality.		
15.02	Synthesize data, analyze trends, and draw conclusions regarding the effect of technology on the individual, society, and the environment.		
15.03	Define assessment techniques, such as trend analysis and experimentation to make decisions about the future development of technology.		
15.04	Identify forecasting techniques to evaluate the results of altering natural systems.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
16.0	Demonstrate an understanding of and be able to select and use energy and power technologies. – The student will be able to:		SC.912.P.10.1
16.01	Discuss how energy cannot be created nor destroyed; however, it can be converted from one form to another.		
16.02	Categorize types of energy into major forms: thermal, radiant, electrical, mechanical, chemical, nuclear, and others.		
16.03	Classify energy resources as renewable or nonrenewable.		
16.04	Construct a power system having a source of energy, a process, and loads.		
17.0	Demonstrate safe and appropriate use of tools, machines, and materials in power and energy technology. – The student will be able to:		
17.01	Select appropriate tools, procedures, and/or equipment needed to produce a product.		
17.02	Demonstrate the safe usage of appropriate tools, procedures, and operation of equipment needed to manufacture a product.		
17.03	Follow laboratory safety rules and procedures.		
17.04	Demonstrate good housekeeping at workstation and within total laboratory.		
17.05	Identify color-coding safety standards.		
17.06	Explain fire prevention and safety precautions and practices for extinguishing fires.		
17.07	Identify harmful effects/potential dangers of familiar hazardous substances/devices to people and the environment.		
18.0	Describe sources of energy. – The student will be able to:		SC.912.P.10.1
18.01	Describe sources of thermal energy.		
18.02	Describe sources of radiant energy.		
18.03	Describe sources of nuclear energy.		
18.04	Describe sources of chemical energy.		
18.05	Describe sources of electrical energy.		
18.06	Describe sources of mechanical energy.		
18.07	Describe sources of fluid energy.		
19.0	Demonstrate technical knowledge and skills related to power and energy systems. – The student will be able to:		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
19.01 Identify and define key terms, categories, and parts of a steam power system.		
19.02 Identify and define key terms, categories, and parts of a hydraulic or pneumatic system.		
19.03 Identify and define key terms, categories, and parts of an electric power system.		
19.04 Identify and define key terms, categories, and parts of a solar power system.		
19.05 Identify and define key terms, categories, and parts of a nuclear power system.		
19.06 Construct, test, and evaluate a variety of power systems.		

Florida Department of Education
Student Performance Standards

Course Title: **Power and Energy Technology II**
Course Number: **8601320**
Course Credit: **1**

Course Description:
This course provides students with intermediate understanding of the knowledge, human relations, and technical skills of energy and power technology.

Florida Standards			Correlation to CTE Program Standard #
01.0	Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Power and Energy Technology.		
	01.01 Key Ideas and Details		
	01.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. LAFS.910.RST.1.1	
	01.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.910.RST.1.2	
	01.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.910.RST.1.3	
	01.02 Craft and Structure		
	01.02.1	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. LAFS.910.RST.2.4	
	01.02.2	Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). LAFS.910.RST.2.5	
	01.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. LAFS.910.RST.2.6	

Florida Standards			Correlation to CTE Program Standard #
01.03	Integration of Knowledge and Ideas		
	01.03.1	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. LAFS.910.RST.3.7	
	01.03.2	Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. LAFS.910.RST.3.8	
	01.03.3	Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. LAFS.910.RST.3.9	
01.04	Range of Reading and Level of Text Complexity		
	01.04.1	By the end of grade 9, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	01.04.2	By the end of grade 10, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 9–10 text complexity band independently and proficiently. LAFS.910.RST.4.10	
02.0	Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Power and Energy Technology.		
02.01	Text Types and Purposes		
	02.01.1	Write arguments focused on discipline-specific content. LAFS.910.WHST.1.1	
	02.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.910.WHST.1.2	
02.02	Production and Distribution of Writing		
	02.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.910.WHST.2.4	
	02.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.910.WHST.2.5	

Florida Standards			Correlation to CTE Program Standard #
	02.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. LAFS.910.WHST.2.6	
02.03	Research to Build and Present Knowledge		
	02.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.910.WHST.3.7	
	02.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. LAFS.910.WHST.3.8	
	02.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.910.WHST.3.9	
02.04	Range of Writing		
	02.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.910.WHST.4.10	
03.0	Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Power and Energy Technology.		
03.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1		
03.02	Reason abstractly and quantitatively. MAFS.K12.MP.2.1		
03.03	Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1		
03.04	Model with mathematics. MAFS.K12.MP.4.1		
03.05	Use appropriate tools strategically. MAFS.K12.MP.5.1		

Florida Standards	Correlation to CTE Program Standard #
03.06 Attend to precision. MAFS.K12.MP.6.1	
03.07 Look for and make use of structure. MAFS.K12.MP.7.1	
03.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA.

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
04.0	Demonstrate an understanding of the characteristics and scope of technology. – The student will be able to:		
04.01	Discuss the nature and development of technological knowledge and processes.		
04.02	Graph the rapid increase in the rate of technological development and diffusion.		
04.03	Conduct specific goal-directed research related to inventions and innovations.		
05.0	Demonstrate an understanding of the core concepts of technology. – The student will be able to:		
05.01	Apply systems thinking logic and creativity with appropriate compromises in complex real-life problems.		
05.02	Discuss technological systems, which are the building blocks of technology and are embedded within larger technological, social, and environmental systems.		
05.03	Select resources involving trade-offs between competing values, such as availability, cost, desirability, and waste.		
05.04	Identify the criteria and constraints of a product or system and determine how they affect the final design and development.		
05.05	Discuss new technologies that create new processes.		
05.06	Organize a management system as the process of planning, organizing, and controlling work.		
07.0	Demonstrate an understanding of the cultural, social, economic, and political effects of technology. – The student will be able to:		
07.01	Discuss changes caused by the use of technology ranging from gradual to rapid and from subtle to obvious.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
07.02	Compare the use of technology involving weighing the trade-offs between the positive and the negative effects.		
07.03	Debate the cultural, social, economic, and political changes caused by the transfer of a technology from one society to another.		
09.0	Demonstrate an understanding of the influence of technology on history. – The student will be able to:		
09.01	Research the history of technology as a powerful force in reshaping the social, cultural, political, and economic landscape.		
09.02	Debate that early in the history of technology, the development of many tools and machines was based not on scientific knowledge but on technological know-how.		
09.03	Discuss the Iron Age as the use of iron and steel as the primary materials for tools.		
09.04	Discuss the Middle Ages and its development of many technological devices that produced long-lasting effects on technology and society.		
09.05	Discuss the Renaissance, a time of rebirth of the arts and humanities, as an important development in the history of technology.		
09.06	Discuss the Industrial Revolution and the development of continuous manufacturing, sophisticated transportation and communication systems, advanced construction practices, and improved education and leisure time.		
09.07	Discuss the Information Age and its placement of emphasis on the processing and exchange of information.		
10.0	Demonstrate an understanding of the attributes of design. – The student will be able to:		SC.912.P.12.2
10.01	Describe the design process; including defining a problem, brainstorming, researching and generating ideas, identifying criteria and specifying constraints, exploring possibilities, selecting an approach, developing a design proposal, making a model or prototype, testing and evaluating the design using specifications, refining the design, creating or making it, and communicating processes and results.		
10.02	Translate design problems that are seldom presented in a clearly defined form.		
10.03	Evaluate a design continually, and improve and revise the idea of the design as needed.		
10.04	Analyze competing requirements of a design, such as criteria, constraints, and efficiency.		
11.0	Demonstrate an understanding of engineering design. – The student will be able to:		SC.912.P.12.2
11.01	Investigate design principles used to evaluate existing designs, to collect data, and to guide the design process.		
11.02	Examine the influence of personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly on the Engineering Design process.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
11.03	Construct a prototype or a working model used to test a design concept by making actual observations and necessary adjustments.		
11.04	Evaluate factors taken into account in the process of engineering.		
12.0	Demonstrate an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving. – The student will be able to:		SC.912.P.12.2
12.01	Employ research and development as a specific problem solving approach that is used intensively in business and industry to prepare devices and systems for the marketplace.		
12.02	Conduct research needed to solve technological problems.		
12.03	Differentiate between technological and non-technological problems, and identify which problems can be solved using technology.		
12.04	Utilize a multidisciplinary approach to solving technological problems.		
13.0	Demonstrate the abilities to apply the design process. – The student will be able to:		SC.912.P.12.2
13.01	Interpret the design problem to solve and decide whether or not to address it.		
13.02	Evaluate criteria and constraints and determine how these will affect the design process.		
13.03	Refine a design by using prototypes and modeling to ensure quality, efficiency, and productivity of the final product.		
13.04	Evaluate the design solution using conceptual, physical, and mathematical models at various intervals of the design process in order to check for proper design and to note areas where improvements are needed.		
13.05	Produce a product or system using a design process.		
13.06	Evaluate final solutions and communicate observations, processes, and results of the entire design process, using verbal, graphic, quantitative, virtual, and written means, in addition to three-dimensional models.		
14.0	Demonstrate the abilities to use and maintain technological products and systems. – The student will be able to:		SC.912.P.12.2
14.01	Document processes and procedures and communicate them to different audiences using appropriate oral and written techniques.		
14.02	Diagnose a system that is malfunctioning and use tools, materials, machines, and knowledge to repair it.		
14.03	Troubleshoot, analyze, and maintain systems to ensure safe and proper function and precision.		
14.04	Operate systems so that they function in the way they were designed.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	14.05 Use computers and calculators to access, retrieve, organize, process, maintain, interpret, and evaluate data and information in order to communicate.		
15.0	Demonstrate the abilities to assess the impact of products and systems. – The student will be able to:		SC.912.P.12.2
	15.01 Collect information and evaluate its quality.		
	15.02 Synthesize data, analyze trends, and draw conclusions regarding the effect of technology on the individual, society, and the environment.		
	15.03 Apply assessment techniques, such as trend analysis and experimentation to make decisions about the future development of technology.		
	15.04 Design forecasting techniques to evaluate the results of altering natural systems.		
16.0	Demonstrate an understanding of and be able to select and use energy and power technologies. – The student will be able to:		SC.912.P.10.1
	16.01 Discuss how energy cannot be created nor destroyed; however, it can be converted from one form to another.		
	16.02 Categorize types of energy into major forms: thermal, radiant, electrical, mechanical, chemical, nuclear, and others.		
	16.03 Explain impossibility of building an engine to perform work that does not exhaust thermal energy to the surroundings.		
	16.04 Classify energy resources as renewable or nonrenewable.		
	16.05 Construct a power system having a source of energy, a process, and loads.		
17.0	Demonstrate safe and appropriate use of tools, machines, and materials in power and energy technology. – The student will be able to:		
	17.01 Select appropriate tools, procedures, and/or equipment needed to produce a product.		
	17.02 Demonstrate the safe usage of appropriate tools, procedures, and operation of equipment needed to manufacture a product.		
	17.03 Follow laboratory safety rules and procedures.		
	17.04 Demonstrate good housekeeping at workstation and within total laboratory.		
	17.05 Identify color-coding safety standards.		
	17.06 Explain fire prevention and safety precautions and practices for extinguishing fires.		
	17.07 Identify harmful effects/potential dangers of familiar hazardous substances/devices to people and the environment.		
20.0	Demonstrate technical knowledge and skills about steam power technology. – The student will be able to:		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	20.01 Describe the operating theory and principles of steam power systems.		
	20.02 Explain the uses and applications of steam power systems.		
	20.03 Identify industries that produce and use steam power systems.		
	20.04 Describe energy and fuel sources for steam power operations.		
	20.05 Perform technical skills in designing, assembling, maintaining, or operating a steam power system.		
21.0	Demonstrate technical knowledge and skills about hydraulic and pneumatic power technology. – The student will be able to:		
	21.01 Describe the operating theory and principles of hydraulic and pneumatic power technology.		
	21.02 Explain the uses and applications of hydraulic and pneumatic power systems.		
	21.03 Identify industries that produce and use hydraulic and pneumatic power systems.		
	21.04 Describe the energy sources for hydraulic and pneumatic power systems.		
	21.05 Perform technical skills in designing, assembling, maintaining, or operating hydraulic and pneumatic power systems.		
22.0	Demonstrate technical knowledge and skills about electric power technology. – The student will be able to:		
	22.01 Describe the operating theory and principles of electric power systems.		
	22.02 Explain the uses and applications of electric power systems.		
	22.03 Identify industries that produce and use electric power systems.		
	22.04 Describe energy and fuel sources for electric power systems.		
	22.05 Perform technical skills in building, assembling, maintaining, or operating an electric power system.		
23.0	Demonstrate technical knowledge and skills about solar cells and fuel cells. – The student will be able to:		
	23.01 Describe the operating theory and principles of solar cell and fuel cell power technology.		
	23.02 Explain the uses and applications of solar cell and fuel cell power technology.		
	23.03 Identify the industries that produce and use solar cell and fuel cell power systems.		
	23.04 Describe the energy and fuel sources for solar cell and fuel cell power systems.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	23.05 Perform technical skills in building, assembling, maintaining, or operating solar cell or fuel cell systems.		
24.0	Demonstrate technical knowledge and skills about nuclear power technology. – The student will be able to:		
	24.01 Describe the operating theory and principles of nuclear power systems.		
	24.02 Explain the uses and applications of nuclear power systems.		
	24.03 Identify industries that produce and use nuclear power systems.		
	24.04 Describe energy and fuel sources for nuclear power systems.		
	24.05 Perform technical skills in building, assembling, maintaining, or operating a simulated or real nuclear power system.		

Florida Department of Education
Student Performance Standards

Course Title: **Power and Energy Technology III**
Course Number: **8601330**
Course Credit: **1**

Course Description:
This course provides students with advanced understanding of the knowledge, human relations, and technical skills of energy and power technology.

Florida Standards			Correlation to CTE Program Standard #
25.0	Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Power and Energy Technology.		
	25.01 Key Ideas and Details		
	25.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. LAFS.1112.RST.1.1	
	25.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.1112.RST.1.2	
	25.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.1112.RST.1.3	
	25.02 Craft and Structure		
	25.02.1	Determine the meaning of symbols key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. LAFS.1112.RST.2.4	
	25.02.2	Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. LAFS.1112.RST.2.5	
	25.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. LAFS.1112.RST.2.6	

Florida Standards			Correlation to CTE Program Standard #
25.03	Integration of Knowledge and Ideas		
	25.03.1	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g. quantitative data, video, multimedia) in order to address a question or solve a problem. LAFS.1112.RST.3.7	
	25.03.2	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. LAFS.1112.RST.3.8	
	25.03.3	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. LAFS.1112.RST.3.9	
25.04	Range of Reading and Level of Text Complexity		
	25.04.1	By the end of grade 11, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	25.04.2	By the end of grade 12, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 11–CCR text complexity band independently and proficiently. LAFS.1112.RST.4.10	
26.0	Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Power and Energy Technology.		
26.01	Text Types and Purposes		
	26.01.1	Write arguments focused on discipline-specific content. LAFS.1112.WHST.1.1	
	26.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.1112.WHST.1.2	
26.02	Production and Distribution of Writing		
	26.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.1112.WHST.2.4	

Florida Standards			Correlation to CTE Program Standard #
	26.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.1112.WHST.2.5	
	26.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. LAFS.1112.WHST.2.6	
	26.03	Research to Build and Present Knowledge	
	26.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.1112.WHST.3.7	
	26.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. LAFS.1112.WHST.3.8	
	26.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.1112.WHST.3.9	
	26.04	Range of Writing	
	26.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.1112.WHST.4.10	
27.0	Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Power and Energy Technology.		
	27.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	
	27.02	Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
	27.03	Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	

Florida Standards	Correlation to CTE Program Standard #
27.04 Model with mathematics. MAFS.K12.MP.4.1	
27.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
27.06 Attend to precision. MAFS.K12.MP.6.1	
27.07 Look for and make use of structure. MAFS.K12.MP.7.1	
27.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA.

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
04.0 Demonstrate an understanding of the characteristics and scope of technology. – The student will be able to:		
04.01 Graph the rapid increase in the rate of technological development and diffusion.		
04.02 Conduct specific goal-directed research related to inventions and innovations.		
05.0 Demonstrate an understanding of the core concepts of technology. – The student will be able to:		
05.01 Apply systems thinking logic and creativity with appropriate compromises in complex real-life problems.		
05.02 Assess technological systems, which are the building blocks of technology and are embedded within larger technological, social, and environmental systems.		
05.03 Assess the stability of a technological system and its influence by all of the components in the system, especially those in the feedback loop.		
05.04 Compare resources involving trade-offs between competing values, such as availability, cost, desirability, and waste.		
05.05 Identify the criteria and constraints of a product or system and determine how they affect the final design and development.		
05.06 Recommend a quality control process to ensure that a product, service or system meets established criteria.		
05.07 Implement a management system as the process of planning, organizing, and controlling work.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
06.0	Demonstrate an understanding of the relationships among technologies and the connection between technology and other fields of study. – The student will be able to:		
06.01	Report the process of patenting to protect a technological idea.		
06.02	Investigate technological progresses that promote the advancement of science and mathematics.		
07.0	Demonstrate an understanding of the cultural, social, economic, and political effects of technology. – The student will be able to:		
07.01	Discuss changes caused by the use of technology ranging from gradual to rapid and from subtle to obvious.		
07.02	Evaluate the use of technology involving weighing the trade-offs between the positive and the negative effects.		
07.03	Discuss ethical considerations important in the development, selection, and use of technologies.		
07.04	Debate the cultural, social, economic, and political changes caused by the transfer of a technology from one society to another.		
10.0	Demonstrate an understanding of the attributes of design. – The student will be able to:		SC.912.P.12.2
10.01	Implement the design process; including defining a problem, brainstorming, researching and generating ideas, identifying criteria and specifying constraints, exploring possibilities, selecting an approach, developing a design proposal, making a model or prototype, testing and evaluating the design using specifications, refining the design, creating or making it, and communicating processes and results.		
10.02	Translate design problems that are seldom presented in a clearly defined form.		
10.03	Evaluate a design continually, and improve and revise the idea of the design as needed.		
10.04	Analyze competing requirements of a design, such as criteria, constraints, and efficiency.		
11.0	Demonstrate an understanding of engineering design. – The student will be able to:		SC.912.P.12.2
11.01	Select design principles used to evaluate existing designs, to collect data, and to guide the design process.		
11.02	Examine the influence of personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly on the Engineering Design process.		
11.03	Construct a prototype or a working model used to test a design concept by making actual observations and necessary adjustments.		
11.04	Evaluate factors taken into account in the process of engineering.		
12.0	Demonstrate an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving. – The student will be able to:		SC.912.P.12.2

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
12.01	Employ research and development as a specific problem solving approach that is used intensively in business and industry to prepare devices and systems for the marketplace.		
12.02	Conduct research needed to solve technological problems.		
12.03	Differentiate between technological and non-technological problems, and identify which problems can be solved using technology.		
12.04	Utilize a multidisciplinary approach to solving technological problems.		
13.0	Demonstrate the abilities to apply the design process. – The student will be able to:		SC.912.P.12.2
13.01	Interpret the design problem to solve and decide whether or not to address it.		
13.02	Evaluate criteria and constraints and determine how these will affect the design process.		
13.03	Refine a design by using prototypes and modeling to ensure quality, efficiency, and productivity of the final product.		
13.04	Evaluate the design solution using conceptual, physical, and mathematical models at various intervals of the design process in order to check for proper design and to note areas where improvements are needed.		
13.05	Produce a product or system using a design process.		
13.06	Evaluate final solutions and communicate observations, processes, and results of the entire design process, using verbal, graphic, quantitative, virtual, and written means, in addition to three-dimensional models.		
14.0	Demonstrate the abilities to use and maintain technological products and systems. – The student will be able to:		SC.912.P.12.2
14.01	Document processes and procedures and communicate them to different audiences using appropriate oral and written techniques.		
14.02	Diagnose a system that is malfunctioning and use tools, materials, machines, and knowledge to repair it.		
14.03	Troubleshoot, analyze, and maintain systems to ensure safe and proper function and precision.		
14.04	Operate systems so that they function in the way they were designed.		
14.05	Use computers and calculators to access, retrieve, organize, process, maintain, interpret, and evaluate data and information in order to communicate.		
15.0	Demonstrate the abilities to assess the impact of products and systems. – The student will be able to:		SC.912.P.12.2
15.01	Collect information and evaluate its quality.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
15.02	Synthesize data, analyze trends, and draw conclusions regarding the effect of technology on the individual, society, and the environment.		
15.03	Apply assessment techniques, such as trend analysis and experimentation to make decisions about the future development of technology.		
15.04	Design forecasting techniques to evaluate the results of altering natural systems.		
16.0	Demonstrate an understanding of and be able to select and use energy and power technologies. – The student will be able to:		SC.912.P.10.1
16.01	Discuss how energy cannot be created nor destroyed; however, it can be converted from one form to another.		
16.02	Categorize types of energy into major forms: thermal, radiant, electrical, mechanical, chemical, nuclear, and others.		
16.03	Explain impossibility of building an engine to perform work that does not exhaust thermal energy to the surroundings.		
16.04	Classify energy resources as renewable or nonrenewable.		
16.05	Construct a power system having a source of energy, a process, and loads.		
17.0	Demonstrate safe and appropriate use of tools, machines, and materials in power and energy technology. – The student will be able to:		
17.01	Select appropriate tools, procedures, and/or equipment needed to produce a product.		
17.02	Demonstrate the safe usage of appropriate tools, procedures, and operation of equipment needed to manufacture a product.		
17.03	Follow laboratory safety rules and procedures.		
17.04	Demonstrate good housekeeping at workstation and within total laboratory.		
17.05	Identify color-coding safety standards.		
17.06	Explain fire prevention and safety precautions and practices for extinguishing fires.		
17.07	Identify harmful effects/potential dangers of familiar hazardous substances/devices to people and the environment.		
28.0	Perform advanced-study and technical skills related to energy and power technology. – The student will be able to:		
28.01	Select an individual or group project in cooperation with the teacher.		
28.02	Develop a written plan of work to carry out the project.		
28.03	Show evidence of technical study in support of the project.		
28.04	Perform skills related to the project.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	28.05 Complete the project as planned.		
29.0	Measure and report the power and efficiency of power producing systems. – The student will be able to:		
	29.01 Measure the power and efficiency of a mechanical system.		
	29.02 Measure the power and efficiency of a fluid system.		
	29.03 Measure the power and efficiency of an electrical system.		
	29.04 Measure the power and efficiency of a thermal system.		
30.0	Conduct a research and experimentation project on an energy and power system. – The student will be able to:		
	30.01 Identify a problem.		
	30.02 State a need to research the problem.		
	30.03 Form a hypothesis about the problem.		
	30.04 Plan the procedures for researching the problem.		
	30.05 Conduct the research following the planned procedures.		
	30.06 Present the research findings in a seminar.		
31.0	Demonstrate an understanding of career opportunities and requirements in the field of power and energy technology. – The student will be able to:		
	31.01 Discuss individual interests related to a career in power and energy technology.		
	31.02 Explore career opportunities related to a career in power and energy technology.		
	31.03 Explore secondary education opportunities related to power and energy technology.		
	31.04 Conduct a job search.		
	31.05 Complete a job application form correctly.		
	31.06 Demonstrate competence in job interview techniques.		
	31.07 Create a professional resume and letter of introduction.		
	31.08 Solicit awards, letters of recommendation and recognition.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
31.09 Organize work samples in a professional, presentable format.		

Additional Information

Laboratory Activities

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

Career and Technical Student Organization (CTSO)

The Florida Technology Student Association (FL-TSA) is the intercurricular career and technical student organization for providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

Cooperative Training – OJT

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

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 Occupational Completion Point (OCP) or a Modified Occupational Completion Point (MOCP). If needed, a student may enroll in the same career and technical course more than once. Documentation should be included in the IEP that clearly indicates that it is anticipated that the student may need an additional year to complete an OCP/MOCP. The student should work on different competencies and new applications of competencies each year toward completion of the OCP/MOCP. After achieving the competencies identified for the year, the student earns credit for the course. It is important to ensure that credits earned by students are reported accurately. The district's information system must be designed to accept multiple credits for the same course number for eligible students with disabilities.

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

Florida Department of Education
Curriculum Framework

Program Title: **Work-Based Experience**
Program Type: **Non Career Preparatory**
Career Cluster: **Engineering & Technology Education**

Secondary – Non Career Preparatory	
Program Number	8601800
CIP Number	08210199CP
Grade Level	9-12; 30, 31
Standard Length	1 credit (Maximum of 3 credits)
Teacher Certification	* SEE NOTE BELOW
CTSO	Florida Technology Student Association (FL-TSA)
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

** Since this program serves as a capstone experience for the student, the teacher certification must be appropriate to the student's Engineering & Technology program of study and the teacher certifications specified in the respective curriculum framework.*

Purpose

The purpose of this course is to provide Engineering and 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, Work-Based experience. The Engineering and Technology Education/Work-Based Experience is 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.

This course is **not** intended to be used as a job preparatory, specific-skill development activity such as found in youth apprenticeship programs.

To enroll in the Engineering and Technology Education Work-Based Experience program, a student must have:

1. Completed one credit of an Engineering & Technology Education program consisting of 3 credits or more.
2. Be currently enrolled in or have completed an Engineering & Technology Education program.
3. Assigned a Work-Based Experience logically related to the Engineering & Technology Education program.

This Work-Based Experience course may be taken by a student for one or more semesters. A student may earn multiple credits in this course.

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 the course shown. The following table illustrates the program structure:

Course Number	Course Title	Length	Level	Graduation Requirement
8601800	Work-Based Experience	1 credit*	2	VO

(Graduation Requirement Abbreviations- EQ= Equally Rigorous Science, PA= Practical Arts, EC= Economics, VO= Career and Technical Education)

** Note: Students may earn multiple credits (maximum of 3 credits) in this course.*

Pre-Placement Planning Conferences: The student, teacher, and the work-based experience site supervisor must participate in a pre-placement conference. It is also recommended that the parents/guardian of the student be included in the pre-placement planning conference. Pre-placement planning is essential to designing learning experiences that are appropriate for each individual's learning needs and career interests. It is critical that all parties involved understand and agree on time schedules, expectations, training/learning activities and evaluation methods. The Student Learner learning agreement should be signed by the student, teacher-coordinator, parent/guardian, and the work-based learning site supervisor.

Site Criteria: The following criteria shall be met when choosing the Work-Based Experience site:

1. The work-based learning must allow experiences that utilize both skills and knowledge directly related to the student's career interests and the Technology Education program in which the student is enrolled or has completed.

2. The work-based experience must provide opportunities for rotation through a wide variety of increasingly responsible experiences beyond routine activities.

3. The work-based experience sponsors must provide skilled work-based experience site supervisors and/or mentors who are interested and willing to assist the student.

4. The work-based experience sponsors must provide a safe and ethically sound environment with up-to-date facilities and equipment. The work-based learning experience must adhere to all state and federal laws and rules regarding the employment of minors. The work-based experience must not displace a paid employee.

5. Timecards documenting the time spent at the work-based experience site must be maintained.

6. When offered for multiple credits, the student should have varied learning experiences in order to provide maximum work-based exposure.

Work Experience: This component shall provide a match between the student's career interests and a work-based situation that will provide exposure to the broad aspects of the selected industry. The assigned tasks should allow a progression and rotation through experiences requiring a variety of knowledge, skills and abilities at increasingly higher levels related to the student's Engineering and Technology Education studies and career interests.

Experience Plan: A work-based experience plan must be developed and implemented for each student based on the curriculum frameworks of the Engineering and Technology Education program. The work-based experience plan must outline learning objectives, methods of learning, activities/responsibilities, time required, student performance standards, provision for supervision, and method(s) of student evaluation. The work-based learning experience plan must be signed by the student, teacher, parent and the work-based experience site supervisor.

Supervision/Site Visits: Teacher-coordinators of the Engineering and Technology Education/Work-Based Experience must monitor and support learning while students are at a work-based site. Teacher-coordinators must visit the work-based experience site as frequently as once every two weeks, but not less than once per month so that students may be observed in all facets of their work-based learning experiences. Students must also be evaluated a minimum of once per grading period by the teacher-coordinator with input from the work-based experience site supervisor. The evaluation should assess how well the student is progressing toward goals established by the student teacher-coordinator, and work-based experience site supervisor. Portfolio assessment, orchestrated by the teacher-coordinator, is a recommended method of student assessment. It is recommended that for every 20 students (or portion thereof) enrolled in Engineering and Technology Education/Work-Based Experience; the teacher-coordinator should be given one hour of coordination release time per day in order to visit students at the work-based learning sites.

Hazardous Occupations Placements: In order for a student learner to obtain a waiver for a specific allowable hazardous occupation the following Florida (Section 450.161, Florida Statutes) Child Labor Law must be followed.

1. The student learner is enrolled in a youth career training program under a recognized state or local educational authority.

2. Such student learner is employed under a written agreement which provides:
   (a) That the work of the student learner in the occupation declared particularly hazardous shall be incidental to the training.
   (b) That such work shall be intermittent and for short periods of time and under the direct and close supervision of a qualified and experienced person.
   (c) That safety instructions shall be given by the school correlated by the employer with on-the-job training.
   (d) That a schedule of organized and progressive work processes to be performed on the job shall have been prepared.

Common Career Technical Core – Career Ready Practices

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

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

2. Apply appropriate academic and technical skills.

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

4. Communicate clearly, effectively and with reason.

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

6. Demonstrate creativity and innovation.

7. Employ valid and reliable research strategies.

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

9. Model integrity, ethical leadership and effective management.

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

11. Use technology to enhance productivity.

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

Standards

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

01.0 Complete a skills inventory.
02.0 Demonstrate acceptable work values.
03.0 Gain practical exposure in broad occupational clusters.

Florida Department of Education
Student Performance Standards

Course Title: **Work-Based Experience**
Course Number: **8601800**
Course Credit: **1**

Course Description:
This course provides Engineering and 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, Work-Based experience. This course is **not** intended to be used as a job preparatory, specific-skill development activity such as found in youth apprenticeship programs.

CTE Standards and Benchmarks	
01.0	Complete a skills inventory. – The student will be able to:
01.01	Practice safety procedures at the work-based site as learned in the classroom setting.
01.02	Demonstrate an understanding of employer safety and general policies and procedures.
01.03	Maintain a daily log of activities documenting job tasks at the work-based site.
02.0	Demonstrate acceptable work values. – The student will be able to:
02.01	Maintain a positive work relationship with peers and mentors.
02.02	Report on time and consistently each assigned day.
02.03	Notify instructor and mentor if unable to report to work-based site.
02.04	Demonstrate adaptive self-management skills.
03.0	Gain practical exposure in broad occupational clusters. – The student will be able to:
03.01	Rotate through a wide variety of increasingly responsible experiences.
03.02	Participate as a team member with a skilled mentor.
03.03	Demonstrate an understanding and appreciation of related occupational groups.
03.04	Apply basic skills in communications, mathematics, and science appropriate to technological content and learning activities.

Additional Information

Career and Technical Student Organization (CTSO)

The Florida Technology Student Association (FL-TSA) is the intercurricular career and technical student organization for providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan to meet individual needs and ensure equal access. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

In addition to accommodations, some secondary students with disabilities (students with an IEP served in Exceptional Student Education (ESE)) will need modifications to meet their needs. Modifications change the outcomes or what the student is expected to learn, e.g., modifying the curriculum of a secondary career and technical education course. Note: postsecondary curriculum and regulated secondary programs cannot be modified.

Some secondary students with disabilities (ESE) may need additional time (i.e., longer than the regular school year), to master the student performance standards associated with a regular Occupational Completion Point (OCP) or a Modified Occupational Completion Point (MOCP). If needed, a student may enroll in the same career and technical course more than once. Documentation should be included in the IEP that clearly indicates that it is anticipated that the student may need an additional year to complete an OCP/MOCP. The student should work on different competencies and new applications of competencies each year toward completion of the OCP/MOCP. After achieving the competencies identified for the year, the student earns credit for the course. It is important to ensure that credits earned by students are reported accurately. The district's information system must be designed to accept multiple credits for the same course number for eligible students with disabilities.

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

Florida Department of Education
Curriculum Framework

Program Title: **Advanced Technology Applications**
Program Type: **Non Career Preparatory**
Career Cluster: **Engineering & Technology Education**

Secondary – Non Career Preparatory	
Program Number	8601900
CIP Number	08210200CP
Grade Level	9-12 & 30, 31
Standard Length	1 credit (Maximum of 3 credits)
Teacher Certification	* SEE NOTE BELOW
CTSO	Florida Technology Student Association (FL-TSA)
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

** Since this program serves as a capstone experience for the student, the teacher certification must be appropriate to the student's Engineering & Technology program of study and the teacher certifications specified in the respective curriculum framework.*

Purpose

The purpose of this course is to serve as a capstone course to provide Engineering and Technology Education students with the opportunity, to develop a 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 of the knowledge previously learned, not only in technology education, but across the curriculum.

To enroll in Advanced Technology Applications, a student must have:

1. Completed three credits of an Engineering & Technology Education program.

2. Received permission of the supervising Engineering & Technology Education Instructor and or Faculty Team.

This Advanced Technology Applications course may be taken by a student for one or more semesters. A student may earn multiple credits in this course (maximum of three).

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 a single one-credit course. The following table illustrates the program structure:

Course Number	Course Title	Length	Level	Graduation Requirement
8601900	Advanced Technology Applications	1 credit*	3	PA

(Graduation Requirement Abbreviations- EQ= Equally Rigorous Science, PA= Practical Arts, EC= Economics, VO= Career and Technical Education)

** Note: Students may earn multiple credits (maximum of 3 credits) in this course.*

The Advanced Technology Applications program **must** include the following components:

Pre-Project Planning Conference: The student, teacher, and team members must participate in a pre-project planning conference, which is essential to designing advanced learning experiences that are appropriate for each individual's learning needs and career interests. It is critical that all parties involved understand and agree on time schedules, expectations, advanced learning applications and evaluation criteria.

Project Criteria: The following criteria shall be met when choosing the Advanced Technology Applications Project:

The project must allow experiences that utilize both skills and knowledge directly related to the student's career interests and the Engineering & Technology Education program in which the student is enrolled or has completed.

The project must provide opportunities for rotation through a wide variety of advanced applications in technology tasks.

The project must provide a safe and ethically sound environment with up-to-date facilities and equipment.

Each student must maintain a journal with daily entries describing:

(a) Time spent on the project (log in and log out)
(b) Description of the activity for the period(s)
(c) Materials/equipment/fixtures used
(d) Problems identified
(e) Possible solutions to problems identified
(f) Work accomplished
(g) Solutions attempted
(h) Solutions that failed
(i) Which led to a new problem statement
(j) Video or Still Images of the project as it progresses.
(k) Plans, sketches, drawings, patterns, fixtures or other documentation of components manufactured or constructed

Each student must maintain a portfolio of the project to include:

(a) Bibliography of all research materials accessed.

(b) A written research paper describing the background information the project is to be based on.
(c) A Laboratory Report to include:
    1. A clear statement of the project
    2. A hypothesis or description of the area of investigation.
    3. A written procedure of each activity as it is accomplished.
    4. List of materials used in each activity.
    5. Data recovered in the form of a data table, charts graphs.
    6. Conclusion
    7. Bibliography
(d) Safety concerns and procedures to be followed.
(e) An abstract.

A progress report at mid-term will be given by each student to include a written research paper, that describes the area of investigation and an oral presentation to the remainder of the class and instructor or supervising faculty team, on the progress of the project, and all work accomplished. The progress report will be the basis for the mid-term evaluation grade.

A final oral progress report presentation at the end of the course will be given by each student or team that includes:

(a) a review of the portfolio and the journal,
(b) a description of the experiment, process or activity
(c) results
(d) problems identified and solutions that worked or did not work, and
(e) a conclusion.

The final progress report will be the basis for the final exam evaluation grade.

When offered for multiple credits, the student should have varied learning experiences in order to provide maximum education exposure.

The course may be supervised by a faculty team consisting of the members of the faculty who will be granting the multiple credit(s) if that is the case.

Project Experience: This component shall provide a match between the student's career interests and a project based situation that will provide exposure to the broad aspects of the selected industry. The assigned tasks should allow a progression and rotation through experiences requiring a variety of knowledge, skills and abilities at increasingly higher levels related to the student's Engineering & Technology Education studies and career interests.

Experience Plan: A project experience plan must be developed and implemented for each student based on the curriculum frameworks of the Engineering & Technology Education program. The project experience plan must outline learning objectives, methods of learning, activities/ responsibilities, time required, student performance standards, provision for supervision, and method(s) of student evaluation. The project learning experience plan must be signed by the student and teacher.

Supervision: Teacher-coordinators of the Advanced Technology Applications project must monitor and support learning. Students must also be evaluated a minimum of once per grading period by the teacher-coordinator. The evaluation should assess how well the student is progressing

toward goals established by the student teacher-coordinator. Portfolio assessment, orchestrated by the teacher-coordinator, is a recommended method of student assessment.

Academic Alignment Table

Academic alignment is an ongoing, collaborative effort of professional educators specializing in the fields of science, mathematics, English/language arts, and Career and Technical Education (CTE). This initiative supports CTE programs by improving student performance through the integration of academic content within CTE courses. Career and Technical Education courses that have been aligned to the Next Generation Sunshine State Standards for Science and the Florida Standards for Mathematics and English/Language Arts will show the following data: the quantity of academic standards in the CTE course; the total number of standards contained in the academic course; and the percentage of alignment to the CTE course.

Courses	Anatomy/ Physiology Honors	Astronomy Solar/Galactic Honors	Biology 1	Chemistry 1	Earth-Space Science	Environmental Science	Genetics	Integrated Science	Marine Science 1 Honors	Physical Science	Physics 1
8601900	**	**	**	**	**	**	**	**	**	**	**

** *Alignment pending review* # *Alignment attempted, but no correlation to academic course*

Courses	Algebra 1	Algebra 2	Geometry	English 1	English 2	English 3	English 4
8601900	**	**	**	**	**	**	**

** *Alignment pending review* # *Alignment attempted, but no correlation to academic course*

Florida Standards for Technical Subjects

Florida Standards (FS) for English Language Arts and Literacy in History/Social Studies, Science, and Technical Subjects are the critical reading and writing literacy standards designed for grade 6 and above. These standards are predicated on teachers of history/social studies, science, and technical subjects using their content area expertise to help students meet the particular challenges of reading, writing, speaking, listening, and language in their respective fields. It is important to note that the 6-12 literacy standards in history/social studies, science, and technical subjects are not meant to replace content standards in those areas but rather to supplement them.

This curriculum framework incorporates the grades 9-10 reading and writing literacy standards in the first two courses of this CTE program and grade 11-12 reading and writing literacy standards in the third and fourth courses of this CTE program. The standards for Mathematical Practices describe varieties of expertise that educators at all levels should seek to develop in their students. These practices rest on important "processes and proficiencies" with longstanding importance in mathematics education. This curriculum framework incorporates the appropriate mathematical practices in the first four courses of this CTE program.

Common Career Technical Core – Career Ready Practices

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

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

2. Apply appropriate academic and technical skills.

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

4. Communicate clearly, effectively and with reason.

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

6. Demonstrate creativity and innovation.

7. Employ valid and reliable research strategies.

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

9. Model integrity, ethical leadership and effective management.

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

11. Use technology to enhance productivity.

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

Standards

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

01.0 Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Advanced Technology Applications.
02.0 Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Advanced Technology Applications.
03.0 Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Advanced Technology Applications.
04.0 Complete a skills inventory.
05.0 Demonstrate acceptable work values.
06.0 Demonstrate the ability to identify and solve problems.
07.0 Successfully work as a member of a team.
08.0 Manage time according to a plan.
09.0 Keep acceptable records of progress, problems and solutions.
10.0 Plan, organize and carry out a project plan.
11.0 Manage resources.
12.0 Use tools, materials, and process in an appropriate and safe manner.
13.0 Demonstrate an understanding of the scientific process.
14.0 Demonstrate appropriate scientific content related to the project.
15.0 Demonstrate appropriate mathematics content related to the project.
16.0 Carry out a research assignment, and document the results of research efforts.
17.0 Use presentation skills, and appropriate media to describe the progress, results and outcome of the experience.
18.0 Demonstrate competency in the area of expertise related to the STEM education program previously completed, that this project is based upon.

Florida Department of Education
Student Performance Standards

Course Title: **Advanced Technology Applications**
Course Number: **8601900**
Course Credit: **1**

Course Description:
This is a project-based capstone course to provide Engineering and Technology Education students with the opportunity to develop a project from "vision" to "reality". Students work in teams to design, engineer, manufacture, construct, test, redesign, test again, and then produce a finished "project".

Florida Standards			Correlation to CTE Program Standard #
01.0	Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Advanced Technology Applications.		
	01.01 Key Ideas and Details		
	01.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. LAFS.1112.RST.1.1	
	01.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.1112.RST.1.2	
	01.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.1112.RST.1.3	
	01.02 Craft and Structure		
	01.02.1	Determine the meaning of symbols key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. LAFS.1112.RST.2.4	
	01.02.2	Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. LAFS.1112.RST.2.5	
	01.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. LAFS.1112.RST.2.6	

Florida Standards			Correlation to CTE Program Standard #
	01.03	Integration of Knowledge and Ideas	
	01.03.1	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g. quantitative data, video, multimedia) in order to address a question or solve a problem. LAFS.1112.RST.3.7	
	01.03.2	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. LAFS.1112.RST.3.8	
	01.03.3	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. LAFS.1112.RST.3.9	
	01.04	Range of Reading and Level of Text Complexity	
	01.04.1	By the end of grade 11, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	01.04.2	By the end of grade 12, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 11–CCR text complexity band independently and proficiently. LAFS.1112.RST.4.10	
02.0	Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Advanced Technology Applications.		
	02.01	Text Types and Purposes	
	02.01.1	Write arguments focused on discipline-specific content. LAFS.1112.WHST.1.1	
	02.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.1112.WHST.1.2	
	02.02	Production and Distribution of Writing	
	02.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.1112.WHST.2.4	

Florida Standards			Correlation to CTE Program Standard #
	02.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.1112.WHST.2.5	
	02.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. LAFS.1112.WHST.2.6	
	02.03	Research to Build and Present Knowledge	
	02.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.1112.WHST.3.7	
	02.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. LAFS.1112.WHST.3.8	
	02.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.1112.WHST.3.9	
	02.04	Range of Writing	
	02.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.1112.WHST.4.10	
03.0		Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Advanced Technology Applications.	
	03.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	
	03.02	Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
	03.03	Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	

Florida Standards	Correlation to CTE Program Standard #
03.04 Model with mathematics. MAFS.K12.MP.4.1	
03.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
03.06 Attend to precision. MAFS.K12.MP.6.1	
03.07 Look for and make use of structure. MAFS.K12.MP.7.1	
03.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
04.0 Complete a safety skills inventory. – The student will be able to:		
04.01 Practice safety procedures while enrolled in this course.		
04.02 Demonstrate an understanding of safety and general policies and procedures.		
05.0 Demonstrate acceptable project values. – The student will be able to:		
05.01 Maintain a positive relationship with peers and		
05.02 Demonstrate adaptive self-management skills.		
05.03 Rotate through a wide variety of increasingly responsible experiences.		
05.04 Apply basic skills in communications, mathematics, and science appropriate to technological content and learning activities.		
06.0 Demonstrate the ability to identify and solve problems. – The student will be able to:		
06.01 Prepare a design brief for each step in the project plan.		
06.02 Identify possible solutions for each design brief.		
06.03 Complete research and development activities associated with each design brief.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
06.04	Document problems as they arise.		
06.05	Prepare a problem statement for any activity that is not successful.		
06.06	Identify possible solutions for the new problem statement.		
06.07	Continue the R & D process until workable solutions are found to each problem stated.		
07.0	Successfully work as a member of a team. – The student will be able to:		
07.01	Accept responsibility for specific tasks in a given situation.		
07.02	Document progress, and provide feedback on work accomplished in a timely manner.		
07.03	Complete assigned tasks in a timely and professional manner.		
07.04	Reassign responsibilities when the need arises.		
07.05	Complete daily tasks as assigned on one's own initiative.		
08.0	Manage time according to a plan. – The student will be able to:		
08.01	Set realistic time frames and schedules.		
08.02	Keep a written time sheet of work accomplished on a daily basis.		
08.03	Meet goals and objectives set by the team.		
08.04	Identify individual priorities.		
08.05	Complete a weekly evaluation of accomplishments, and reevaluate goals, objectives and priorities as needed.		
09.0	Keep acceptable records of progress problems and solutions. – The student will be able to:		
09.01	Develop a record keeping system in the form of a log book to record daily progress.		
09.02	Use a project journal to identify problem statement		
09.03	Develop a portfolio of work accomplished to include design drawings, research, drawings and plans, models, mock-ups and prototypes.		
10.0	Plan, organize, and carry out a project plan. – The student will be able to:		
10.01	Determine the scope of a project.		
10.02	Organize the team according to individual strengths.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
10.03	Assign specific tasks within a team.		
10.04	Determine project priorities.		
10.05	Identify required resources.		
10.06	Plan research, development, design, construction and manufacturing activities as required.		
10.07	Carry out the project plan to successful completion.		
11.0	Manage resources. – The student will be able to:		
11.01	Identify required resources for each stage of the project plan.		
11.02	Determine the methods needed to acquire needed resources.		
11.03	Demonstrate good judgment in the use of resources.		
11.04	Recycle and reuse resources where appropriate.		
11.05	Demonstrate an understanding of proper legal and ethical waste disposal.		
12.0	Use tools, materials, and processes in an appropriate and safe manner. – The student will be able to:		
12.01	Identify the proper tool for a given job.		
12.02	Use tools and machines in a safe manner.		
12.03	Adhere to laboratory or job site safety rules and procedures.		
12.04	Identify the application of processes appropriate to the task at hand.		
12.05	Identify materials appropriate to their application.		
13.0	Demonstrate an understanding of the scientific process. – The student will be able to:		
13.01	State a problem clearly.		
13.02	Identify and write a hypothesis.		
13.03	Develop a materials list.		
13.04	Develop a step by step procedure.		
13.05	Follow a written procedure.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
13.06	Record data.		
13.07	Make a conclusion based on results, observations and data.		
13.08	Document progress using a laboratory report.		
13.09	Write an abstract.		
14.0	Demonstrate appropriate scientific content related to the project. – The student will be able to:		
14.01	Document how all matter has observable, measurable properties.		
14.02	Apply the basic principles of atomic theory.		
14.03	Determine how energy may be changed in form with varying efficiency.		
14.04	Document the interaction of matter and energy.		
14.05	Document how types of motion may be described, measured, and predicted.		
14.06	Demonstrate how types of force that act on an object and the effect of that force can be described, measured, and predicted.		
14.07	Demonstrate how science, technology, and society are interwoven and interdependent.		
15.0	Demonstrate appropriate mathematics content related to the project. – The student will be able to:		
15.01	Identify different ways numbers are represented and used.		
15.02	Demonstrate proper use of the number systems.		
15.03	Develop effective operations on numbers and the relationships among these operations.		
15.04	Use estimation in problem solving and computation.		
15.05	Apply theories used in the solution to numbers.		
15.06	Use quantities in the real world and uses the measures to solve problems.		
15.07	Compare data within systems of measurement (both standard/nonstandard and metric/customary).		
15.08	Solve the problem mathematical using length, time, weight/mass, temperature, money, perimeter, area, and volume, and estimates the effects of measurement errors on calculations.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
15.09	Apply appropriate units and instruments for measurement to achieve the degree of precision and accuracy required in real-world situations.		
15.10	Describe, draw, Identify, and analyzes two-and three-dimensional shapes.		
15.11	Visualize and illustrate ways in which shapes can be combined, subdivided, and changed.		
15.12	Coordinate geometry to locate objects in both two and three dimensions and to describe objects algebraically.		
15.13	Describe, analyze, and generalize a wide variety of patterns, relations, and functions.		
15.14	Uses expressions, equations, inequalities, graphs, and formulas to represent and interpret situations.		
15.15	Uses the tools of data analysis for managing information.		
15.16	Identify patterns and makes predictions from an orderly display of data using concepts of probability and statistics.		
15.17	Uses statistical methods to make inferences and valid arguments about real-world situations.		
16.0	Carry out a research assignment, and document the results of research efforts. – The student will be able to:		
16.01	Identify the basic research needed to develop the project plan.		
16.02	Identify available resources for completing background research required in the project plan.		
16.03	Demonstrate the ability to locate resource materials in a library, data base, internet and other research resources.		
16.04	Demonstrate the ability to organize information retrieval.		
16.05	Demonstrate the ability to prepare a topic outline.		
16.06	Write a draft of the research report.		
16.07	Edit and proof the research report. Use proper form for a bibliography, footnotes, quotations and references.		
16.08	Prepare an electronically composed research paper in proper form.		
16.09	Conduct a research experiment.		
16.10	Complete a laboratory report on the experiment, documenting results, data and observations.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	16.11 Prepare a display of the experiment to include a title, problem statement, hypothesis, material list, procedure, results and observations, data tables and or graphs and charts, illustrations of the procedure, models, mock ups, devices or fixtures required, conclusion safety statements and an abstract.		
17.0	Use presentation skills, and appropriate media to describe the progress, results and outcomes of the experience. – The student will be able to:		
	17.01 Prepare a multi-media presentation on the completed project.		
	17.02 Make an oral presentation, using multi-media materials.		
	17.03 Review the presentation, and make changes in the delivery method(s) to improve presentation skills.		
18.0	Demonstrate competency in the area of expertise related to the STEM education program previously completed that this project is based upon. – The student will be able to:		
	18.01 Demonstrate a mastery of the content of the selected subject area.		
	18.02 Demonstrate the ability to use related technological tools, materials and processes related to the specific program area.		
	18.03 Demonstrate the ability to apply the knowledge, experience and skill developed in the previous program completion to the successful completion of this demonstration.		
	18.04 Demonstrate the acquisition of additional knowledge, skill and experience in one area of the selected field of study beyond the performance standards of the initial program standards.		

Additional Information

Laboratory Activities

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

Career and Technical Student Organization (CTSO)

The Florida Technology Student Association (FL-TSA) is the intercurricular career and technical student organization for providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

Accommodations

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

Florida Department of Education
Curriculum Framework

Program Title: **Production Technology**
Program Type: **Non Career Preparatory**
Career Cluster: **Engineering & Technology Education**

Secondary – Non Career Preparatory	
Program Number	8604000
CIP Number	0821011400
Grade Level	9-12; 30, 31
Standard Length	3 credits
Teacher Certification	TEC ED 1 @2 ENG @7 7G
CTSO	Florida Technology Student Association (FL-TSA)
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 production technology 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 tolls, machines, instruments, materials, processes and systems in business and industry.

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

Program Structure

This program is a planned sequence of instruction consisting of three one-credit courses. The following table illustrates the program structure:

Course Number	Course Title	Length	Level	Graduation Requirement
8600540	Production Technology I	1 credit	2	PA
8600640	Production Technology II	1 credit	2	PA
8601740	Production Technology III	1 credit	3	PA

(Graduation Requirement Abbreviations- EQ= Equally Rigorous Science, PA= Practical Arts, EC= Economics, VO= Career and Technical Education)

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.

Academic Alignment Table

Academic alignment is an ongoing, collaborative effort of professional educators specializing in the fields of science, mathematics, English/language arts, and Career and Technical Education (CTE). This initiative supports CTE programs by improving student performance through the integration of academic content within CTE courses. Career and Technical Education courses that have been aligned to the Next Generation Sunshine State Standards for Science and the Florida Standards for Mathematics and English/Language Arts will show the following data: the quantity of academic standards in the CTE course; the total number of standards contained in the academic course; and the percentage of alignment to the CTE course.

Courses	Anatomy/ Physiology Honors	Astronomy Solar/Galactic Honors	Biology 1	Chemistry 1	Earth-Space Science	Environmental Science	Genetics	Integrated Science	Marine Science 1 Honors	Physical Science	Physics 1
8600540	2/87 2%	15/80 19%	8/83 10%	11/69 16%	8/67 12%	12/70 17%	4/69 6%	10/82 12%	16/66 24%	15/74 20%	9/72 13%
8600640	1/87 1%	13/80 16%	8/83 10%	11/69 16%	6/67 9%	12/70 17%	4/69 6%	9/82 11%	13/66 20%	14/74 19%	9/72 13%
8601740	1/87 1%	14/80 18%	8/83 10%	12/69 17%	7/67 10%	12/70 17%	4/69 6%	9/82 11%	14/66 21%	15/74 20%	10/72 14%

** *Alignment pending review* # *Alignment attempted, but no correlation to academic course*

Courses	Algebra 1	Algebra 2	Geometry	English 1	English 2	English 3	English 4
8600540	**	**	**	**	**	**	**
8600640	**	**	**	**	**	**	**

Courses	Algebra 1	Algebra 2	Geometry	English 1	English 2	English 3	English 4
8601740	**	**	**	**	**	**	**

** *Alignment pending review* # *Alignment attempted, but no correlation to academic course*

Florida Standards for Technical Subjects

Florida Standards (FS) for English Language Arts and Literacy in History/Social Studies, Science, and Technical Subjects are the critical reading and writing literacy standards designed for grade 6 and above. These standards are predicated on teachers of history/social studies, science, and technical subjects using their content area expertise to help students meet the particular challenges of reading, writing, speaking, listening, and language in their respective fields. It is important to note that the 6-12 literacy standards in history/social studies, science, and technical subjects are not meant to replace content standards in those areas but rather to supplement them.

This curriculum framework incorporates the grades 9-10 reading and writing literacy standards in the first two courses of this CTE program and grade 11-12 reading and writing literacy standards in the third and fourth courses of this CTE program. The standards for Mathematical Practices describe varieties of expertise that educators at all levels should seek to develop in their students. These practices rest on important "processes and proficiencies" with longstanding importance in mathematics education. This curriculum framework incorporates the appropriate mathematical practices in the first four courses of this CTE program.

Common Career Technical Core – Career Ready Practices

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

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

2. Apply appropriate academic and technical skills.

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

4. Communicate clearly, effectively and with reason.

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

6. Demonstrate creativity and innovation.

7. Employ valid and reliable research strategies.

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

9. Model integrity, ethical leadership and effective management.

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

11. Use technology to enhance productivity.

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

Standards

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

01.0 Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Production Technology.
02.0 Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Production Technology.
03.0 Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Production Technology.
04.0 Demonstrate an understanding of the characteristics and scope of technology.
05.0 Demonstrate an understanding of the core concepts of technology.
06.0 Demonstrate an understanding of the relationships among technologies and the connection between technology and other fields of study.
07.0 Demonstrate an understanding of the cultural, social, economic, and political effects of technology.
08.0 Demonstrate an understanding of the effects of technology on the environment.
09.0 Demonstrate an understanding of the influence of technology on history.
10.0 Demonstrate an understanding of the attributes of design.
11.0 Demonstrate an understanding of engineering design.
12.0 Demonstrate an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving.
13.0 Demonstrate the abilities to apply the design process.
14.0 Demonstrate the abilities to use and maintain technological products and systems.
15.0 Demonstrate the abilities to assess the impact of products and systems.
16.0 Demonstrate an understanding of and be able to select and use manufacturing technologies.
17.0 Demonstrate an understanding of and be able to select and use construction technologies.
18.0 Demonstrate safe and appropriate use of tools and machines in production technology.
19.0 Demonstrate the ability to properly identify, organize, plan, and allocate resources.
20.0 Demonstrate an understanding of entrepreneurship.
21.0 Produce a custom product from industrial materials and composites using preprocessing, processing, and post-processing production technology skills.
22.0 Plan and participate in a mass production system for manufacturing a product.
23.0 Utilize modern production technology in the processes of separating, forming, combining, fabrication, and finishing of materials.
24.0 Demonstrate technical knowledge and skills in the designing and engineering of constructed works.
25.0 Demonstrate technical knowledge and skills in the contracting, estimating, bidding, and scheduling processes.
26.0 Demonstrate technical knowledge and skills in the construction and finishing of structures.
27.0 Perform advanced study and technical skills related to production technology.
28.0 Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Production Technology.
29.0 Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Production Technology.
30.0 Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Production Technology.

31.0 Demonstrate an understanding of career opportunities and requirements in the field of production technology.

Florida Department of Education
Student Performance Standards

Course Title: **Production Technology I**
Course Number: **8600540**
Course Credit: **1**

Course Description:
This course provides students with an introduction to the knowledge, human relations, and technological skills found today in production technology.

Florida Standards			Correlation to CTE Program Standard #
01.0	Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Production Technology.		
	01.01 Key Ideas and Details		
	01.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. LAFS.910.RST.1.1	
	01.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.910.RST.1.2	
	01.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.910.RST.1.3	
	01.02 Craft and Structure		
	01.02.1	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. LAFS.910.RST.2.4	
	01.02.2	Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). LAFS.910.RST.2.5	
	01.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. LAFS.910.RST.2.6	

Florida Standards			Correlation to CTE Program Standard #
01.03	Integration of Knowledge and Ideas		
	01.03.1	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. LAFS.910.RST.3.7	
	01.03.2	Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. LAFS.910.RST.3.8	
	01.03.3	Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. LAFS.910.RST.3.9	
01.04	Range of Reading and Level of Text Complexity		
	01.04.1	By the end of grade 9, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	01.04.2	By the end of grade 10, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 9–10 text complexity band independently and proficiently. LAFS.910.RST.4.10	
02.0	Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Production Technology.		
02.01	Text Types and Purposes		
	02.01.1	Write arguments focused on discipline-specific content. LAFS.910.WHST.1.1	
	02.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.910.WHST.1.2	
02.02	Production and Distribution of Writing		
	02.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.910.WHST.2.4	
	02.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.910.WHST.2.5	

Florida Standards			Correlation to CTE Program Standard #
	02.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. LAFS.910.WHST.2.6	
02.03	Research to Build and Present Knowledge		
	02.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.910.WHST.3.7	
	02.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. LAFS.910.WHST.3.8	
	02.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.910.WHST.3.9	
02.04	Range of Writing		
	02.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.910.WHST.4.10	
03.0	Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Production Technology.		
03.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1		
03.02	Reason abstractly and quantitatively. MAFS.K12.MP.2.1		
03.03	Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1		
03.04	Model with mathematics. MAFS.K12.MP.4.1		
03.05	Use appropriate tools strategically. MAFS.K12.MP.5.1		

Florida Standards	Correlation to CTE Program Standard #
03.06 Attend to precision. MAFS.K12.MP.6.1	
03.07 Look for and make use of structure. MAFS.K12.MP.7.1	
03.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
04.0	Demonstrate an understanding of the characteristics and scope of technology. – The student will be able to:		SC.912.N.1.1
04.01	Discuss the nature and development of technological knowledge and processes.		
04.02	Explain the rapid increase in the rate of technological development and diffusion.		
04.03	Conduct specific goal-directed research related to inventions and innovations.		
05.0	Demonstrate an understanding of the core concepts of technology. – The student will be able to:		SC.912.N.1.1, 3, 4, 7
05.01	Identify systems thinking logic and creativity with appropriate compromises in complex real-life problems.		
05.02	Define technological systems, which are the building blocks of technology and are embedded within larger technological, social, and environmental systems.		
05.03	Identify resources involving trade-offs between competing values, such as availability, cost, desirability, and waste.		
05.04	Identify the criteria and constraints of a product or system and determine how they affect the final design and development.		
05.05	Define a management system as the process of planning, organizing, and controlling work.		
06.0	Demonstrate an understanding of the relationships among technologies and the connection between technology and other fields of study. – The student will be able to:		SC.912.N.1.1, 4, 5
06.01	Identify technology transfer occurring when a new user applies an existing innovation developed for one purpose in a different function.		
06.02	Identify technological innovation resulting when ideas, knowledge, or skills are shared within a technology, among technologies, or across other fields.		
06.03	Outline the process of patenting to protect a technological idea.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
06.04	Identify technological progresses that promote the advancement of science and mathematics.		
07.0	Demonstrate an understanding of the cultural, social, economic, and political effects of technology. – The student will be able to:		SC.912.N.4.2
07.01	Classify the use of technology involving weighing the trade-offs between the positive and the negative effects.		
07.02	Identify ethical considerations important in the development, selection, and use of technologies.		
07.03	List the cultural, social, economic, and political changes caused by the transfer of a technology from one society to another.		
08.0	Demonstrate an understanding of the effects of technology on the environment. . – The student will be able to:		SC.912.L.17.16, 17, 20
08.01	List trade-offs of developing technologies to reduce the use of resources.		
08.02	Identify technologies devised to reduce the negative consequences of other technologies.		
08.03	Discuss the implementation of technologies involving the weighing of trade-offs between predicted positive and negative effects on the environment.		
09.0	Demonstrate an understanding of the influence of technology on history. – The student will be able to:		SC.912.N.2.4; 3.2
09.01	Research how the evolution of civilization has been directly affected by, and has in turn affected, the development and use of tools and materials.		
09.02	Define the history of technology as a powerful force in reshaping the social, cultural, political, and economic landscape.		
09.03	Discuss that early in the history of technology, the development of many tools and machines was based not on scientific knowledge but on technological know-how.		
09.04	Define the Iron Age as the use of iron and steel as the primary materials for tools.		
10.0	Demonstrate an understanding of the attributes of design. – The student will be able to:		SC.912.N.1.1, 3, 4, 5, 6, 7; 3.3, 5; 4.2
10.01	Recognize the design process; including defining a problem, brainstorming, researching and generating ideas, identifying criteria and specifying constraints, exploring possibilities, selecting an approach, developing a design proposal, making a model or prototype, testing and evaluating the design using specifications, refining the design, creating or making it, and communicating processes and results.		
10.02	Restate design problems that are seldom presented in a clearly defined form.		
10.03	Check and critique a design continually, and improve and revise the idea of the design as needed.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
10.04	List competing requirements of a design, such as criteria, constraints, and efficiency.		
11.0	Demonstrate an understanding of engineering design. – The student will be able to:		SC.912.N.1.1, 3, 4, 5, 6, 7; 3.3, 5; 4.2
11.01	Identify design principles used to evaluate existing designs, to collect data, and to guide the design process.		
11.02	Describe the influence of personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly on the engineering design process.		
11.03	Construct a prototype or a working model used to test a design concept by making actual observations and necessary adjustments.		
11.04	Identify factors taken into account in the process of engineering.		
12.0	Demonstrate an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving. – The student will be able to:		SC.912.N.1.1, 3, 4, 5, 6, 7; 2.1, 4, 5; 3.1, 3, 5; 4.2
12.01	Define research and development as a specific problem solving approach that is used intensively in business and industry to prepare devices and systems for the marketplace.		
12.02	Identify research needed to solve technological problems.		
12.03	Differentiate between technological and non-technological problems, and identify which problems can be solved using technology.		
12.04	Utilize a multidisciplinary approach to solving technological problems.		
13.0	Demonstrate the abilities to apply the design process. – The student will be able to:		SC.912.N.1.1, 3, 4, 5, 6, 7; 3.3, 5; 4.2
13.01	Identify the design problem to solve and decide whether or not to address it.		
13.02	List criteria and constraints and determine how these will affect the design process.		
13.03	Refine a design by using prototypes and modeling to ensure quality, efficiency, and productivity of the final product.		
13.04	Evaluate the design solution using conceptual, physical, and mathematical models at various intervals of the design process in order to check for proper design and to note areas where improvements are needed.		
13.05	Develop a product or system using a design process.		
13.06	Evaluate final solutions and communicate observations, processes, and results of the entire design process, using verbal, graphic, quantitative, virtual, and written means, in addition to three-dimensional models.		
14.0	Demonstrate the abilities to use and maintain technological products and systems. – The student will be able to:		SC.912.N.1.1

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
14.01	Document processes and procedures and communicate them to different audiences using appropriate oral and written techniques.		
14.02	Diagnose a system that is malfunctioning and use tools, materials, machines, and knowledge to repair it.		
14.03	Troubleshoot, analyze, and maintain systems to ensure safe and proper function and precision.		
14.04	Operate systems so that they function in the way they were designed.		
14.05	Use computers and calculators to access, retrieve, organize, process, maintain, interpret, and evaluate data and information in order to communicate.		
15.0	Demonstrate the abilities to assess the impact of products and systems. – The student will be able to:	MAFS.912.S-IC.2.6	SC.912.L.17.4, 16; SC.912.N.1.1, 4, 6
15.01	Collect information and evaluate its quality.		
15.02	Synthesize data, analyze trends, and draw conclusions regarding the effect of technology on the individual, society, and the environment.		
15.03	Define assessment techniques, such as trend analysis and experimentation to make decisions about the future development of technology.		
15.04	Identify forecasting techniques to evaluate the results of altering natural systems.		
16.0	Demonstrate an understanding of and be able to select and use manufacturing technologies. – The student will be able to:		SC.912.P.8.8
16.01	Service products to keep them in good operating condition.		
16.02	Classify materials based on their qualities as natural, synthetic, or mixed.		
16.03	Classify goods as durable goods designed to operate for a long period of time, or non-durable goods designed to operate for a short period of time.		
16.04	Identify and classify manufacturing systems into types, such as customized production, batch production, and continuous production.		
16.05	Discuss the interchangeability of parts to increase the effectiveness of manufacturing processes.		
16.06	Identify chemical technologies providing a means for humans to alter or modify materials and to produce chemical products.		
16.07	Employ marketing techniques involving establishing a product's identity, conducting research on its potential, advertising it, distributing it, and selling it.		
17.0	Demonstrate an understanding of and be able to select and use construction technologies. – The student will be able to:		
17.01	Define infrastructure as the underlying base or basic framework of a system.		
17.02	Identify a variety of processes and procedures used in constructing structures.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	17.03 Identify requirements involved in the design of structures.		
	17.04 Recommend maintenance, alterations, or renovations to improve a structure or alter its intended use.		
	17.05 Identify prefabricated materials used in some structures.		
18.0	Demonstrate safe and appropriate use of tools and machines in production technology. – The student will be able to:		
	18.01 Select appropriate tools, procedures, and/or equipment.		
	18.02 Demonstrate the safe usage of appropriate tools, procedures, and operation of equipment.		
	18.03 Follow laboratory safety rules and procedures.		
	18.04 Demonstrate good housekeeping at workstation within total laboratory.		
	18.05 Identify color-coding safety standards.		
	18.06 Explain fire prevention and safety precautions and practices for extinguishing fires.		
	18.07 Identify harmful effects/potential dangers of familiar hazardous substances/devices to people and the environment.		
19.0	Demonstrate the ability to properly identify, organize, plan, and allocate resources. – The student will be able to:		
	19.01 Demonstrate the ability to select goal-relevant activities, rank them, allocate time, and prepare and follow schedules.		
	19.02 Use or prepare budgets, make forecasts, keep records, and make adjustments to meet objectives.		
	19.03 Demonstrate the ability to acquire, store, allocate, and use materials or space efficiently.		
	19.04 Display an understanding of the efficient use of human resources.		
20.0	Demonstrate an understanding of entrepreneurship. – The student will be able to:		
	20.01 Define entrepreneurship.		
	20.02 Describe the importance of entrepreneurship to the American economy.		
	20.03 List the advantages and disadvantages of business ownership.		
	20.04 Identify the risks involved in ownership of a business.		
	20.05 Identify the necessary personal characteristics of a successful entrepreneur.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
20.06	Identify the business skills needed to operate a small business efficiently and effectively.		
21.0	Produce a custom product from industrial materials and composites using preprocessing, processing, and post-processing production technology skills. – The student will be able to:		SC.912.P.8.8
21.01	Apply the technology processes of separating and forming materials.		
21.02	Apply the technology processes of conditioning materials.		
21.03	Apply the technology processes of combining in the fabrication and finishing of materials.		
21.04	Apply modern production technology practices and equipment in the processes of separating, forming, conditioning, fabricating and finishing of materials (CNC, CAD, CAM, Robotics, etc.).		
21.05	Produce a custom product.		
22.0	Plan and participate in a mass production system for manufacturing a product. – The student will be able to:		
22.01	Design and develop jigs, fixtures, or a model system for product mass production.		
22.02	Develop an organized plan of tools, materials, processes, and systems to efficiently mass-produce a product.		
22.03	Apply pre-processing, processing, and post-processing techniques in the mass production of a product.		
22.04	Participate in the organized mass production of a product.		
24.0	Demonstrate technical knowledge and skills in the designing and engineering of constructed works. – The student will be able to:		
24.01	Develop construction plans using appropriate tools, symbols, and technical drawing techniques.		
24.02	Describe building codes, permits, and inspection requirements.		
24.03	Sketch and draw a plan for a construction project.		
24.04	Display knowledge about regional planning and the construction of civil and community projects (roads, parks, dams, airports, seaports, warehouses, shopping centers, factories, skyscrapers, etc.).		
26.0	Demonstrate technical knowledge and skills in the construction and finishing of structures. – The student will be able to:		
26.01	Describe the properties of structures.		
26.02	Use appropriate terminology associated with construction technology.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
26.03 Identify and describe the materials used in the construction of superstructures.		
26.04 Apply a variety of techniques, tools, materials, and processes in the construction of structures.		

Florida Department of Education
Student Performance Standards

Course Title: **Production Technology II**
Course Number: **8600640**
Course Credit: **1**

Course Description:
This program provides students with an intermediate understanding of the knowledge, human relations, and technological skills found today in production technology.

Florida Standards			Correlation to CTE Program Standard #
01.0	Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Production Technology.		
	01.01 Key Ideas and Details		
	01.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. LAFS.910.RST.1.1	
	01.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.910.RST.1.2	
	01.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.910.RST.1.3	
	01.02 Craft and Structure		
	01.02.1	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. LAFS.910.RST.2.4	
	01.02.2	Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). LAFS.910.RST.2.5	
	01.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. LAFS.910.RST.2.6	

Florida Standards			Correlation to CTE Program Standard #
01.03	Integration of Knowledge and Ideas		
	01.03.1	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. LAFS.910.RST.3.7	
	01.03.2	Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. LAFS.910.RST.3.8	
	01.03.3	Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. LAFS.910.RST.3.9	
01.04	Range of Reading and Level of Text Complexity		
	01.04.1	By the end of grade 9, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	01.04.2	By the end of grade 10, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 9–10 text complexity band independently and proficiently. LAFS.910.RST.4.10	
02.0	Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Production Technology.		
02.01	Text Types and Purposes		
	02.01.1	Write arguments focused on discipline-specific content. LAFS.910.WHST.1.1	
	02.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.910.WHST.1.2	
02.02	Production and Distribution of Writing		
	02.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.910.WHST.2.4	
	02.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.910.WHST.2.5	

Florida Standards			Correlation to CTE Program Standard #
	02.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. LAFS.910.WHST.2.6	
02.03	Research to Build and Present Knowledge		
	02.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.910.WHST.3.7	
	02.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. LAFS.910.WHST.3.8	
	02.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.910.WHST.3.9	
02.04	Range of Writing		
	02.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.910.WHST.4.10	
03.0	Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Production Technology.		
03.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1		
03.02	Reason abstractly and quantitatively. MAFS.K12.MP.2.1		
03.03	Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1		
03.04	Model with mathematics. MAFS.K12.MP.4.1		
03.05	Use appropriate tools strategically. MAFS.K12.MP.5.1		

Florida Standards	Correlation to CTE Program Standard #
03.06 Attend to precision. MAFS.K12.MP.6.1	
03.07 Look for and make use of structure. MAFS.K12.MP.7.1	
03.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
04.0	Demonstrate an understanding of the characteristics and scope of technology. – The student will be able to:		SC.912.N.1.1
04.01	Discuss the nature and development of technological knowledge and processes.		
04.02	Explain the rapid increase in the rate of technological development and diffusion.		
04.03	Conduct specific goal-directed research related to inventions and innovations.		
04.04	Discuss current technological developments that are/were driven by profit motive and the market.		
05.0	Demonstrate an understanding of the core concepts of technology—-The student will be able to:		SC.912.N.1.1, 3, 4, 7
05.01	Apply systems thinking logic and creativity with appropriate compromises in complex real-life problems.		
05.02	Discuss technological systems, which are the building blocks of technology and are embedded within larger technological, social, and environmental systems.		
05.03	Select resources involving trade-offs between competing values, such as availability, cost, desirability, and waste.		
05.04	Identify the criteria and constraints of a product or system and determine how they affect the final design and development.		
05.05	List strategies for optimizing a technological process or methodology of designing or making a product, dependent on criteria and constraints.		
05.06	Discuss new technologies that create new processes.		
05.07	Describe a quality control process to ensure that a product, service, or system meets established criteria.		
05.08	Organize a management system as the process of planning, organizing, and controlling work.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
06.0	Demonstrate an understanding of the relationships among technologies and the connection between technology and other fields of study.—-The student will be able to:		SC.912.N.1.1, 4, 5
06.01	Discuss technology transfer occurring when a new user applies an existing innovation developed for one purpose in a different function.		
06.02	Explain technological innovation resulting when ideas, knowledge, or skills are shared within a technology, among technologies, or across other fields.		
06.03	Report the process of patenting to protect a technological idea.		
06.04	Discuss technological progresses that promote the advancement of science and mathematics.		
07.0	Demonstrate an understanding of the cultural, social, economic, and political effects of technology. – The student will be able to:		SC.912.N.4.2
07.01	Compare the use of technology involving weighing the trade-offs between the positive and the negative effects.		
07.02	Discuss ethical considerations important in the development, selection, and use of technologies.		
07.03	Debate the cultural, social, economic, and political changes caused by the transfer of a technology from one society to another.		
08.0	Demonstrate an understanding of the effects of technology on the environment. . – The student will be able to:		SC.912.L.17.16, 17, 20
08.01	Compare trade-offs of developing technologies to reduce the use of resources.		
08.02	Identify technology to monitor the environment and provide information as a basis for decision-making.		
08.03	Discuss technologies devised to reduce the negative consequences of other technologies.		
08.04	Make decisions about the implementation of technologies involving the weighing of trade-offs between predicted positive and negative effects on the environment.		
09.0	Demonstrate an understanding of the influence of technology on history. – The student will be able to:		SC.912.N.2.4; 3.2
09.01	Discuss how the evolution of civilization has been directly affected by, and has in turn affected, the development and use of tools and materials.		
09.02	Research the history of technology as a powerful force in reshaping the social, cultural, political, and economic landscape.		
09.03	Debate that early in the history of technology, the development of many tools and machines was based not on scientific knowledge but on technological know-how.		
09.04	Define the Iron Age as the use of iron and steel as the primary materials for tools.		
09.05	Define the Middle Ages and its development of many technological devices that produced long-lasting effects on technology and society.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
09.06	Define the Renaissance, a time of rebirth of the arts and humanities, as an important development in the history of technology.		
09.07	Define the Industrial Revolution and the development of continuous manufacturing, sophisticated transportation and communication systems, advanced construction practices, and improved education and leisure time.		
09.08	Define the Information Age and its placement of emphasis on the processing and exchange of information.		
10.0	Demonstrate an understanding of the attributes of design. – The student will be able to:		SC.912.N.1.1, 3, 4, 5, 6, 7; 3.3, 5; 4.2
10.01	Apply the design process; including defining a problem, brainstorming, researching and generating ideas, identifying criteria and specifying constraints, exploring possibilities, selecting an approach, developing a design proposal, making a model or prototype, testing and evaluating the design using specifications, refining the design, creating or making it, and communicating processes and results.		
10.02	Translate design problems that are seldom presented in a clearly defined form.		
10.03	Evaluate a design continually, and improve and revise the idea of the design as needed.		
10.04	Consider competing requirements of a design, such as criteria, constraints, and efficiency.		
11.0	Demonstrate an understanding of engineering design. – The student will be able to:		SC.912.N.1.1, 3, 4, 5, 6, 7; 2.2; 3.3, 5; 4.2
11.01	Investigate design principles used to evaluate existing designs, to collect data, and to guide the design process.		
11.02	Examine the influence of personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly on the engineering design process.		
11.03	Construct a prototype or a working model used to test a design concept by making actual observations and necessary adjustments.		
11.04	Evaluate factors taken into account in the process of engineering.		
12.0	Demonstrate an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving. – The student will be able to:		SC.912.N.1.1, 3, 4, 5, 6, 7; 2.1, 4, 5; 3.1, 3, 5; 4.2
12.01	Employ research and development as a specific problem solving approach that is used intensively in business and industry to prepare devices and systems for the marketplace.		
12.02	Conduct research needed to solve technological problems.		
12.03	Differentiate between technological and non-technological problems, and identify which problems can be solved using technology.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
12.04	Utilize a multidisciplinary approach to solving technological problems.		
13.0	Demonstrate the abilities to apply the design process. – The student will be able to:		SC.912.N.1.1, 3, 4, 5, 6, 7; 3.3, 5; 4.2
13.01	Interpret the design problem to solve and decide whether or not to address it.		
13.02	Evaluate criteria and constraints and determine how these will affect the design process.		
13.03	Refine a design by using prototypes and modeling to ensure quality, efficiency, and productivity of the final product.		
13.04	Evaluate the design solution using conceptual, physical, and mathematical models at various intervals of the design process in order to check for proper design and to note areas where improvements are needed.		
13.05	Produce a product or system using a design process.		
13.06	Evaluate final solutions and communicate observations, processes, and results of the entire design process, using verbal, graphic, quantitative, virtual, and written means, in addition to three-dimensional models.		
14.0	Demonstrate the abilities to use and maintain technological products and systems. – The student will be able to:	MAFS.912.S-IC.2.6	SC.912.N.1.1
14.01	Document processes and procedures and communicate them to different audiences using appropriate oral and written techniques.		
14.02	Diagnose a system that is malfunctioning and use tools, materials, machines, and knowledge to repair it.		
14.03	Troubleshoot, analyze, and maintain systems to ensure safe and proper function and precision.		
14.04	Operate systems so that they function in the way they were designed.		
14.05	Use computers and calculators to access, retrieve, organize, process, maintain, interpret, and evaluate data and information in order to communicate.		
14.06	Use the tools of data analysis for managing information.		
15.0	Demonstrate the abilities to assess the impact of products and systems. – The student will be able to:	MAFS.912.S-IC.2	SC.912.L.17.4, 16; SC.912.N.1.1, 4, 6
15.01	Collect information and evaluate its quality.		
15.02	Synthesize data, analyze trends, and draw conclusions regarding the effect of technology on the individual, society, and the environment.		
15.03	Apply assessment techniques, such as trend analysis and experimentation to make decisions about the future development of technology.		
15.04	Design forecasting techniques to evaluate the results of altering natural systems.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
16.0	Demonstrate an understanding of and be able to select and use manufacturing technologies. – The student will be able to:		SC.912.P.8.8
16.01	Service products to keep them in good operating condition.		
16.02	Classify materials based on their qualities as natural, synthetic, or mixed.		
16.03	Classify goods as durable goods designed to operate for a long period of time, or non-durable goods designed to operate for a short period of time.		
16.04	Identify and classify manufacturing systems into types, such as customized production, batch production, and continuous production.		
16.05	Discuss the interchangeability of parts to increase the effectiveness of manufacturing processes.		
16.06	Identify chemical technologies providing a means for humans to alter or modify materials and to produce chemical products.		
16.07	Employ marketing techniques involving establishing a product's identity, conducting research on its potential, advertising it, distributing it, and selling it.		
17.0	Demonstrate an understanding of and be able to select and use construction technologies. – The student will be able to:		
17.01	Define infrastructure as the underlying base or basic framework of a system.		
17.02	Identify a variety of processes and procedures used in constructing structures.		
17.03	Identify requirements involved in the design of structures.		
17.04	Recommend maintenance, alterations, or renovations to improve a structure or alter its intended use.		
17.05	Identify prefabricated materials used in some structures.		
18.0	Demonstrate safe and appropriate use of tools and machines in production technology. – The student will be able to:		
18.01	Select appropriate tools, procedures, and/or equipment.		
18.02	Demonstrate the safe usage of appropriate tools, procedures, and operation of equipment.		
18.03	Follow laboratory safety rules and procedures.		
18.04	Demonstrate good housekeeping at workstation within total laboratory.		
18.05	Identify color-coding safety standards.		
18.06	Explain fire prevention and safety precautions and practices for extinguishing fires.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	18.07 Identify harmful effects/potential dangers of familiar hazardous substances/devices to people and the environment.		
19.0	Demonstrate the ability to properly identify, organize, plan, and allocate resources. – The student will be able to:		
	19.01 Demonstrate the ability to select goal-relevant activities, rank them, allocate time, and prepare and follow schedules.		
	19.02 Use or prepare budgets, make forecasts, keep records, and make adjustments to meet objectives.		
	19.03 Demonstrate the ability to acquire, store, allocate, and use materials or space efficiently.		
	19.04 Display an understanding of the efficient use of human resources.		
20.0	Demonstrate an understanding of entrepreneurship. – The student will be able to:		
	20.01 Define entrepreneurship.		
	20.02 Describe the importance of entrepreneurship to the American economy.		
	20.03 List the advantages and disadvantages of business ownership.		
	20.04 Identify the risks involved in ownership of a business.		
	20.05 Identify the necessary personal characteristics of a successful entrepreneur.		
	20.06 Identify the business skills needed to operate a small business efficiently and effectively.		
21.0	Produce a custom product from industrial materials and composites using preprocessing, processing, and post-processing production technology skills. – The student will be able to:		SC.912.P.8.8
	21.01 Apply the technology processes of separating and forming materials.		
	21.02 Apply the technology processes of conditioning materials.		
	21.03 Apply the technology processes of combining in the fabrication and finishing of materials.		
	21.04 Produce a custom product.		
22.0	Plan and participate in a mass production system for manufacturing a product. – The student will be able to:		
	22.01 Design and develop jigs, fixtures, or a model system for product mass production.		
	22.02 Develop an organized plan of tools, materials, processes, and systems to efficiently mass-produce a product.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	22.03 Apply pre-processing, processing, and post-processing techniques in the mass production of a product.		
	22.04 Participate in the organized mass production of a product.		
23.0	Utilize modern production technology in the processes of separating, forming, combining, fabrication, and finishing of materials. – The student will be able to:		
	23.01 Design a program to be used in the separating forming and finishing of materials.		
	23.02 Develop and perform an operational program of forming materials.		
	23.03 Develop and perform an operational program of finishing materials.		
	23.04 Develop and perform an operational program that will use combination of modern production processes, equipment, and materials.		
24.0	Demonstrate technical knowledge and skills in the designing and engineering of constructed works. – The student will be able to:		
	24.01 Develop construction plans using appropriate tools, symbols, and technical drawing techniques.		
	24.02 Describe building codes, permits, and inspection requirements.		
	24.03 Sketch and draw a plan for a construction project.		
	24.04 Display knowledge about regional planning and the construction of civil and community projects (roads, parks, dams, airports, seaports, warehouses, shopping centers, factories, skyscrapers, etc.).		
26.0	Demonstrate technical knowledge and skills in the construction and finishing of structures. – The student will be able to:		
	26.01 Describe the properties of structures.		
	26.02 Use appropriate terminology associated with construction technology.		
	26.03 Identify and describe the materials used in the construction of superstructures.		
	26.04 Apply a variety of techniques, tools, materials, and processes in the construction of structures.		
27.0	Perform advanced study and technical skills related to production technology. – The student will be able to:		
	27.01 Select an individual or group project in cooperation with the teacher.		
	27.02 Develop a written plan of work to carry out the project.		
	27.03 Show evidence of technical study in support of the project.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
27.04 Perform skills related to the project.		
27.05 Complete the project as planned.		

Florida Department of Education
Student Performance Standards

Course Title: **Production Technology III**
Course Number: **8601740**
Course Credit: **1**

Course Description:
This program provides students with an advanced understanding of the knowledge, human relations, and technological skills found today in production technology.

Florida Standards			Correlation to CTE Program Standard #
28.0	Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Production Technology.		
	28.01 Key Ideas and Details		
	28.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. LAFS.1112.RST.1.1	
	28.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.1112.RST.1.2	
	28.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.1112.RST.1.3	
	28.02 Craft and Structure		
	28.02.1	Determine the meaning of symbols key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. LAFS.1112.RST.2.4	
	28.02.2	Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. LAFS.1112.RST.2.5	
	28.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. LAFS.1112.RST.2.6	

Florida Standards			Correlation to CTE Program Standard #
	28.03	Integration of Knowledge and Ideas	
	28.03.1	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g. quantitative data, video, multimedia) in order to address a question or solve a problem. LAFS.1112.RST.3.7	
	28.03.2	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. LAFS.1112.RST.3.8	
	28.03.3	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. LAFS.1112.RST.3.9	
	28.04	Range of Reading and Level of Text Complexity	
	28.04.1	By the end of grade 11, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	28.04.2	By the end of grade 12, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 11–CCR text complexity band independently and proficiently. LAFS.1112.RST.4.10	
29.0	Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Production Technology.		
	29.01	Text Types and Purposes	
	29.01.1	Write arguments focused on discipline-specific content. LAFS.1112.WHST.1.1	
	29.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.1112.WHST.1.2	
	29.02	Production and Distribution of Writing	
	29.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.1112.WHST.2.4	

Florida Standards			Correlation to CTE Program Standard #
	29.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.1112.WHST.2.5	
	29.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. LAFS.1112.WHST.2.6	
	29.03	Research to Build and Present Knowledge	
	29.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.1112.WHST.3.7	
	29.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. LAFS.1112.WHST.3.8	
	29.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.1112.WHST.3.9	
	29.04	Range of Writing	
	29.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.1112.WHST.4.10	
30.0	Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Production Technology.		
	30.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	
	30.02	Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
	30.03	Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	

Florida Standards	Correlation to CTE Program Standard #
30.04 Model with mathematics. MAFS.K12.MP.4.1	
30.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
30.06 Attend to precision. MAFS.K12.MP.6.1	
30.07 Look for and make use of structure. MAFS.K12.MP.7.1	
30.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

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NGSSS-Sci = Next Generation Sunshine State Standards for Science

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
04.0 Demonstrate an understanding of the characteristics and scope of technology. – The student will be able to:		SC.912.N.1.1
04.01 Graph the rapid increase in the rate of technological development and diffusion.		
04.02 Conduct specific goal-directed research related to inventions and innovations.		
04.03 Evaluate current technological developments that are/were driven by profit motive and the market.		
05.0 Demonstrate an understanding of the core concepts of technology—-The student will be able to:		SC.912.N.1.1, 3, 4, 7
05.01 Apply systems thinking logic and creativity with appropriate compromises in complex real-life problems.		
05.02 Assess technological systems, which are the building blocks of technology and are embedded within larger technological, social, and environmental systems.		
05.03 Assess the stability of a technological system and its influence by all of the components in the system, especially those in the feedback loop.		
05.04 Compare resources involving trade-offs between competing values, such as availability, cost, desirability, and waste.		
05.05 Identify the criteria and constraints of a product or system and determine how they affect the final design and development.		
05.06 Propose strategies for optimizing a technological process or methodology of designing or making a product, dependent on criteria and constraints.		
05.07 Discuss new technologies that create new processes.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
05.08	Recommend a quality control process to ensure that a product, service or system meets established criteria.		
05.09	Organize a management system as the process of planning, organizing, and controlling work.		
05.10	Outline complex systems that have many layers of controls and feedback loops to provide information.		
06.0	Demonstrate an understanding of the relationships among technologies and the connection between technology and other fields of study.—-The student will be able to:		SC.912.N.1.1, 4, 5
06.01	Identify technology transfer occurring when a new user applies an existing innovation developed for one purpose in a different function.		
06.02	Identify technological innovation resulting when ideas, knowledge, or skills are shared within a technology, among technologies, or across other fields.		
06.03	Outline the process of patenting to protect a technological idea.		
06.04	Identify technological progresses that promote the advancement of science and mathematics.		
07.0	Demonstrate an understanding of the cultural, social, economic, and political effects of technology. – The student will be able to:		SC.912.N.4.2
07.01	Classify the use of technology involving weighing the trade-offs between the positive and the negative effects.		
07.02	Identify ethical considerations important in the development, selection, and use of technologies.		
07.03	List the cultural, social, economic, and political changes caused by the transfer of a technology from one society to another.		
08.0	Demonstrate an understanding of the effects of technology on the environment. – The student will be able to:		SC.912.L.17.16, 17, 20
08.01	Select technologies to conserve water, soil, and energy through such techniques as reusing, reducing and recycling.		
08.02	List trade-offs of developing technologies to reduce the use of resources.		
08.03	Use technology to monitor the environment and provide information as a basis for decision-making.		
08.04	Identify technologies devised to reduce the negative consequences of other technologies.		
08.05	Discuss the implementation of technologies involving the weighing of trade-offs between predicted positive and negative effects on the environment.		
09.0	Demonstrate an understanding of the influence of technology on history. – The student will be able to:		SC.912.N.2.4; 3.2
09.01	Assess how the evolution of civilization has been directly affected by, and has in turn affected, the development and use of tools and materials.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
09.02	Research the history of technology as a powerful force in reshaping the social, cultural, political, and economic landscape.		
09.03	Debate that early in the history of technology, the development of many tools and machines was based not on scientific knowledge but on technological know-how.		
09.04	Define the Iron Age as the use of iron and steel as the primary materials for tools.		
09.05	Discuss the Industrial Revolution and the development of continuous manufacturing, sophisticated transportation and communication systems, advanced construction practices, and improved education and leisure time.		
10.0	Demonstrate an understanding of the attributes of design. – The student will be able to:		SC.912.N.1.1, 3, 4, 5, 6, 7; 3.3, 5; 4.2
10.01	Apply the design process; including defining a problem, brainstorming, researching and generating ideas, identifying criteria and specifying constraints, exploring possibilities, selecting an approach, developing a design proposal, making a model or prototype, testing and evaluating the design using specifications, refining the design, creating or making it, and communicating processes and results.		
10.02	Translate design problems that are seldom presented in a clearly defined form.		
10.03	Evaluate a design continually, and improve and revise the idea of the design as needed.		
10.04	Analyze competing requirements of a design, such as criteria, constraints, and efficiency.		
11.0	Demonstrate an understanding of engineering design. – The student will be able to:		SC.912.N.1.1, 3, 4, 5, 6, 7; 2.2; 3.3, 5; 4.2
11.01	Select design principles used to evaluate existing designs, to collect data, and to guide the design process.		
11.02	Examine the influence of personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly on the engineering design process.		
11.03	Construct a prototype or a working model used to test a design concept by making actual observations and necessary adjustments.		
11.04	Evaluate factors taken into account in the process of engineering.		
12.0	Demonstrate an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving. – The student will be able to:		SC.912.N.1.1, 3, 4, 5, 6, 7; 2.1, 4, 5; 3.1, 3, 5; 4.2
12.01	Employ research and development as a specific problem solving approach that is used intensively in business and industry to prepare devices and systems for the marketplace.		
12.02	Conduct research needed to solve technological problems.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
12.03	Differentiate between technological and non-technological problems, and identify which problems can be solved using technology.		
12.04	Utilize a multidisciplinary approach to solving technological problems.		
13.0	Demonstrate the abilities to apply the design process. – The student will be able to:		SC.912.N.1.1, 3, 4, 5, 6, 7; 3.3, 5; 4.2
13.01	Interpret the design problem to solve and decide whether or not to address it.		
13.02	Evaluate criteria and constraints and determine how these will affect the design process.		
13.03	Refine a design by using prototypes and modeling to ensure quality, efficiency, and productivity of the final product.		
13.04	Evaluate the design solution using conceptual, physical, and mathematical models at various intervals of the design process in order to check for proper design and to note areas where improvements are needed.		
13.05	Produce a product or system using a design process.		
13.06	Evaluate final solutions and communicate observations, processes, and results of the entire design process, using verbal, graphic, quantitative, virtual, and written means, in addition to three-dimensional models.		
14.0	Demonstrate the abilities to use and maintain technological products and systems. – The student will be able to:		SC.912.N.1.1
14.01	Document processes and procedures and communicate them to different audiences using appropriate oral and written techniques.		
14.02	Diagnose a system that is malfunctioning and use tools, materials, machines, and knowledge to repair it.		
14.03	Troubleshoot, analyze, and maintain systems to ensure safe and proper function and precision.		
14.04	Operate systems so that they function in the way they were designed.		
14.05	Use computers and calculators to access, retrieve, organize, process, maintain, interpret, and evaluate data and information in order to communicate.		
15.0	Demonstrate the abilities to assess the impact of products and systems. – The student will be able to:	MAFS.912.S-IC.2	SC.912.L.17.4, 16; SC.912.N.1.1, 4, 6
15.01	Collect information and evaluate its quality.		
15.02	Synthesize data, analyze trends, and draw conclusions regarding the effect of technology on the individual, society, and the environment.		
15.03	Apply assessment techniques, such as trend analysis and experimentation to make decisions about the future development of technology.		
15.04	Design forecasting techniques to evaluate the results of altering natural systems.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
16.0	Demonstrate an understanding of and be able to select and use manufacturing technologies. – The student will be able to:		SC.912.P.8.8
16.01	Service products to keep them in good operating condition.		
16.02	Classify materials based on their qualities as natural, synthetic, or mixed.		
16.03	Classify goods as durable goods designed to operate for a long period of time, or non-durable goods designed to operate for a short period of time.		
16.04	Identify and classify manufacturing systems into types, such as customized production, batch production, and continuous production.		
16.05	Discuss the interchangeability of parts to increase the effectiveness of manufacturing processes.		
16.06	Identify chemical technologies providing a means for humans to alter or modify materials and to produce chemical products.		
16.07	Employ marketing techniques involving establishing a product's identity, conducting research on its potential, advertising it, distributing it, and selling it.		
17.0	Demonstrate an understanding of and be able to select and use construction technologies. – The student will be able to:		
17.01	Define infrastructure as the underlying base or basic framework of a system.		
17.02	Identify a variety of processes and procedures used in constructing structures.		
17.03	Identify requirements involved in the design of structures.		
17.04	Recommend maintenance, alterations, or renovations to improve a structure or alter its intended use.		
17.05	Identify prefabricated materials used in some structures.		
18.0	Demonstrate safe and appropriate use of tools and machines in production technology. – The student will be able to:		
18.01	Select appropriate tools, procedures, and/or equipment.		
18.02	Demonstrate the safe usage of appropriate tools, procedures, and operation of equipment.		
18.03	Follow laboratory safety rules and procedures.		
18.04	Demonstrate good housekeeping at workstation within total laboratory.		
18.05	Identify color-coding safety standards.		
18.06	Explain fire prevention and safety precautions and practices for extinguishing fires.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	18.07 Identify harmful effects/potential dangers of familiar hazardous substances/devices to people and the environment.		
19.0	Demonstrate the ability to properly identify, organize, plan, and allocate resources. – The student will be able to:		
	19.01 Demonstrate the ability to select goal-relevant activities, rank them, allocate time, and prepare and follow schedules.		
	19.02 Use or prepare budgets, make forecasts, keep records, and make adjustments to meet objectives.		
	19.03 Demonstrate the ability to acquire, store, allocate, and use materials or space efficiently.		
	19.04 Display an understanding of the efficient use of human resources.		
20.0	Demonstrate an understanding of entrepreneurship. – The student will be able to:		
	20.01 Define entrepreneurship.		
	20.02 Describe the importance of entrepreneurship to the American economy.		
	20.03 List the advantages and disadvantages of business ownership.		
	20.04 Identify the risks involved in ownership of a business.		
	20.05 Identify the necessary personal characteristics of a successful entrepreneur.		
	20.06 Identify the business skills needed to operate a small business efficiently and effectively.		
23.0	Utilize modern production technology in the processes of separating, forming, combining, fabrication, and finishing of materials. – The student will be able to:		
	23.01 Design a program to be used in the separating forming and finishing of materials.		
	23.02 Develop and perform an operational program of forming materials.		
	23.03 Develop and perform an operational program of finishing materials.		
	23.04 Develop and perform an operational program that will use combination of modern production processes, equipment, and materials.		
	23.05 Produce a product using modern production technology.		
24.0	Demonstrate technical knowledge and skills in the designing and engineering of constructed works. – The student will be able to:		
	24.01 Develop construction plans using appropriate tools, symbols, and technical drawing techniques.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	24.02 Describe building codes, permits, and inspection requirements.		
	24.03 Sketch and draw a plan for a construction project.		
	24.04 Display knowledge about regional planning and the construction of civil and community projects (roads, parks, dams, airports, seaports, warehouses, shopping centers, factories, skyscrapers, etc.).		
25.0	Demonstrate technical knowledge and skills in the contracting, estimating, bidding, and scheduling processes. – The student will be able to:		
	25.01 Estimate construction costs using various methods.		
	25.02 Read and prepare bid invitations for contractors to build a construction project.		
	25.03 Establish criteria for awarding a construction contract.		
	25.04 Develop a construction schedule.		
	25.05 Describe the content of a construction contract and performance bond.		
26.0	Demonstrate technical knowledge and skills in the construction and finishing of structures. – The student will be able to:		
	26.01 Describe the properties of structures.		
	26.02 Use appropriate terminology associated with construction technology.		
	26.03 Identify and describe the materials used in the construction of superstructures.		
	26.04 Apply a variety of techniques, tools, materials, and processes in the construction of structures.		
	26.05 Apply technical knowledge and skills in the installation of utilities.		
	26.06 Apply technical knowledge and skills in the process of enclosing structures.		
	26.07 Apply technical knowledge and skills in the process of finishing the interior and exterior of a constructed structure.		
27.0	Perform advanced study and technical skills related to production technology. – The student will be able to:		
	27.01 Identify and research a design problem related to production technology.		
	27.02 Produce a detailed design and plan for the production of the solution.		
	27.03 Complete the advanced design project as planned.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	27.04 Deliver a professional quality presentation of the design process and solution.		
31.0	Demonstrate an understanding of career opportunities and requirements in the field of production technology. – The student will be able to:		
	31.01 Discuss individual interests related to a career in production technology.		
	31.02 Explore career opportunities related to production technology.		
	31.03 Explore secondary education opportunities related to production technology.		
	31.04 Conduct a job search.		
	31.05 Complete a job application form correctly.		
	31.06 Demonstrate competence in job interview techniques.		
	31.07 Create a professional resume and letter of introduction.		
	31.08 Solicit awards, letters of recommendation and recognition.		
	31.09 Organize work samples in a professional, presentable format.		

Additional Information

Laboratory Activities

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

Career and Technical Student Organization (CTSO)

The Florida Technology Student Association (FL-TSA) is the intercurricular career and technical student organization for providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

Cooperative Training – OJT

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

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 Occupational Completion Point (OCP) or a Modified Occupational Completion Point (MOCP). If needed, a student may enroll in the same career and technical course more than once. Documentation should be included in the IEP that clearly indicates that it is anticipated that the student may need an additional year to complete an OCP/MOCP. The student should work on different competencies and new applications of competencies each year toward completion of the OCP/MOCP. After achieving the competencies identified for the year, the student earns credit for the course. It is important to ensure that credits earned by students are reported accurately. The district's information system must be designed to accept multiple credits for the same course number for eligible students with disabilities.

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

Florida Department of Education
Curriculum Framework

Program Title: **Engineering Technology**
Program Type: **Non Career Preparatory**
Career Cluster: **Engineering & Technology Education**

NOTE: This program has been **daggered for deletion** with 2014-2015 being the last cohort of students permitted to enroll in the program. After 2014-2015, **no new students may be enrolled in this program**. Students already enrolled in the program may, at the District's discretion, continue taking courses in the program until completion. Alternative enrollment option for students is Applied Engineering Technology (8401100).

Secondary – Non Career Preparatory	
Program Number	8607000
CIP Number	0821011700
Grade Level	9-12; 30, 31
Standard Length	3 credits
Teacher Certification	TEC ED 1 @2 ENG @7 7G ENG TEC 7G
CTSO	Florida Technology Student Association (FL-TSA)
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 the applications of 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.

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 one-credit courses. The following table illustrates the program structure:

Course Number	Course Title	Length	Level	Graduation Requirement
8600570	Engineering Technology I	1 credit	2	PA
8600670	Engineering Technology II	1 credit	2	PA
8601770	Engineering Technology III	1 credit	3	PA

(Graduation Requirement Abbreviations- EQ= Equally Rigorous Science, PA= Practical Arts, EC= Economics, VO= Career and Technical Education)

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.

Academic Alignment Table

Academic alignment is an ongoing, collaborative effort of professional educators specializing in the fields of science, mathematics, English/language arts, and Career and Technical Education (CTE). This initiative supports CTE programs by improving student performance through the integration of academic content within CTE courses. Career and Technical Education courses that have been aligned to the Next Generation Sunshine State Standards for Science and the Florida Standards for Mathematics and English/Language Arts will show the following data: the quantity of academic standards in the CTE course; the total number of standards contained in the academic course; and the percentage of alignment to the CTE course.

Courses	Anatomy/ Physiology Honors	Astronomy Solar/Galactic Honors	Biology 1	Chemistry 1	Earth-Space Science	Environmental Science	Genetics	Integrated Science	Marine Science 1 Honors	Physical Science	Physics 1
8600570	5/87 6%	14/80 18%	11/83 13%	12/69 17%	13/67 19%	13/70 19%	5/69 7%	16/82 20%	17/66 26%	21/74 28%	13/72 18%
8600670	3/87 3%	10/80 13%	10/83 12%	10/69 14%	11/67 16%	7/70 10%	3/69 4%	14/82 17%	10/66 15%	18/74 24%	11/72 15%
8601770	7/87 8%	14/80 18%	6/83 7%	14/69 20%	7/67 10%	11/70 16%	7/69 10%	10/82 12%	14/66 21%	14/74 19%	15/72 21%

** *Alignment pending review* # *Alignment attempted, but no correlation to academic course*

Courses	Algebra 1	Algebra 2	Geometry	English 1	English 2	English 3	English 4
8600570	10/67 15%	9/75 12%	4/54 7%	23/46 50%	23/45 51%	#	#
8600670	10/67 15%	5/75 7%	4/54 7%	23/46 50%	23/45 51%	#	#

Courses	Algebra 1	Algebra 2	Geometry	English 1	English 2	English 3	English 4
8601770	7/67 10%	8/75 11%	1/54 2%	#	#	22/45 49%	22/45 49%

** *Alignment pending review* # *Alignment attempted, but no correlation to academic course*

Florida Standards for Technical Subjects

Florida Standards (FS) for English Language Arts and Literacy in History/Social Studies, Science, and Technical Subjects are the critical reading and writing literacy standards designed for grade 6 and above. These standards are predicated on teachers of history/social studies, science, and technical subjects using their content area expertise to help students meet the particular challenges of reading, writing, speaking, listening, and language in their respective fields. It is important to note that the 6-12 literacy standards in history/social studies, science, and technical subjects are not meant to replace content standards in those areas but rather to supplement them.

This curriculum framework incorporates the grades 9-10 reading and writing literacy standards in the first two courses of this CTE program and grade 11-12 reading and writing literacy standards in the third and fourth courses of this CTE program. The standards for Mathematical Practices describe varieties of expertise that educators at all levels should seek to develop in their students. These practices rest on important "processes and proficiencies" with longstanding importance in mathematics education. This curriculum framework incorporates the appropriate mathematical practices in the first four courses of this CTE program.

Common Career Technical Core – Career Ready Practices

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

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

2. Apply appropriate academic and technical skills.

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

4. Communicate clearly, effectively and with reason.

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

6. Demonstrate creativity and innovation.

7. Employ valid and reliable research strategies.

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

9. Model integrity, ethical leadership and effective management.

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

11. Use technology to enhance productivity.

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

Standards

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

01.0 Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Engineering Technology.
02.0 Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Engineering Technology.
03.0 Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Engineering Technology.
04.0 Demonstrate an understanding of the characteristics and scope of technology.
05.0 Demonstrate an understanding of the core concepts of technology.
06.0 Demonstrate an understanding of the relationships among technologies and the connection between technology and other fields of study.
07.0 Demonstrate an understanding of the cultural, social, economic, and political effects of technology.
08.0 Demonstrate an understanding of the effects of technology on the environment.
09.0 Demonstrate an understanding of the role of society in the development and use of technology.
10.0 Demonstrate an understanding of the influence of technology on history.
11.0 Demonstrate an understanding of the attributes of design.
12.0 Demonstrate an understanding of the engineering design.
13.0 Demonstrate an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving.
14.0 Demonstrate the abilities to apply the design process.
15.0 Demonstrate the abilities to use and maintain technological products and systems.
16.0 Demonstrate the abilities to assess the impact of products and systems.
17.0 Demonstrate an understanding of and be able to select and use medical technologies.
18.0 Demonstrate an understanding of and be able to select and use agricultural and related biotechnologies.
19.0 Demonstrate an understanding of and be able to select and use energy and power technologies.
20.0 Demonstrate an understanding of and be able to select and use information and communication technologies.
21.0 Demonstrate an understanding of and be able to select and use transportation technologies.
22.0 Demonstrate an understanding of and be able to select and use manufacturing technologies.
23.0 Demonstrate an understanding of and be able to select and use construction technologies.
24.0 Demonstrate safe and appropriate use of tools and machines in engineering technology.
25.0 Demonstrate the ability to properly identify, organize, plan, and allocate resources.
26.0 Demonstrate the functional characteristics of the engineering design team.
27.0 Demonstrate technical knowledge and skills in the processes and systems related to engineering.
28.0 Demonstrate technical knowledge and skills in the designing, engineering, and analysis of constructed works.
29.0 Perform advanced study and technical skills related to engineering technology.
30.0 Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Engineering Technology.
31.0 Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Engineering Technology.

32.0 Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Engineering Technology.
33.0 Demonstrate an understanding of career opportunities and requirements in the field of engineering technology.

Florida Department of Education
Student Performance Standards

Course Title: **Engineering Technology I**
Course Number: **8600570**
Course Credit: **1**

Course Description:
This course provides students with an introduction to the knowledge, human relations, and technological skills found today in technical professions.

Florida Standards			Correlation to CTE Program Standard #
01.0	Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Engineering Technology.		
	01.01 Key Ideas and Details		
	01.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. LAFS.910.RST.1.1	
	01.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.910.RST.1.2	
	01.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.910.RST.1.3	
	01.02 Craft and Structure		
	01.02.1	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. LAFS.910.RST.2.4	
	01.02.2	Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). LAFS.910.RST.2.5	
	01.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. LAFS.910.RST.2.6	

Florida Standards			Correlation to CTE Program Standard #
01.03	Integration of Knowledge and Ideas		
	01.03.1	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. LAFS.910.RST.3.7	
	01.03.2	Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. LAFS.910.RST.3.8	
	01.03.3	Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. LAFS.910.RST.3.9	
01.04	Range of Reading and Level of Text Complexity		
	01.04.1	By the end of grade 9, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	01.04.2	By the end of grade 10, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 9–10 text complexity band independently and proficiently. LAFS.910.RST.4.10	
02.0	Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Engineering Technology.		
02.01	Text Types and Purposes		
	02.01.1	Write arguments focused on discipline-specific content. LAFS.910.WHST.1.1	
	02.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.910.WHST.1.2	
02.02	Production and Distribution of Writing		
	02.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.910.WHST.2.4	
	02.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.910.WHST.2.5	

Florida Standards			Correlation to CTE Program Standard #
	02.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. LAFS.910.WHST.2.6	
02.03	Research to Build and Present Knowledge		
	02.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.910.WHST.3.7	
	02.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. LAFS.910.WHST.3.8	
	02.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.910.WHST.3.9	
02.04	Range of Writing		
	02.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.910.WHST.4.10	
03.0	Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Engineering Technology.		
03.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1		
03.02	Reason abstractly and quantitatively. MAFS.K12.MP.2.1		
03.03	Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1		
03.04	Model with mathematics. MAFS.K12.MP.4.1		
03.05	Use appropriate tools strategically. MAFS.K12.MP.5.1		

Florida Standards	Correlation to CTE Program Standard #
03.06 Attend to precision. MAFS.K12.MP.6.1	
03.07 Look for and make use of structure. MAFS.K12.MP.7.1	
03.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
04.0	Demonstrate an understanding of the characteristics and scope of technology. – The student will be able to:		
04.01	Discuss the nature and development of technological knowledge and processes.	LAFS.910.L.3.6; LAFS.910.SL.1.1	SC.912.N.1.1
04.02	Explain the rapid increase in the rate of technological development and diffusion.	LAFS.910.L.3.6; LAFS.910.SL.1.1	SC.912.N.4.2
04.03	Conduct specific goal-directed research related to inventions and innovations.	LAFS.910.W.3.7, 8, 9; LAFS.910.RI.1.1, 2, 3; 2.4; LAFS.910.L.3.6	SC.912.N.1.1
04.04	Discuss current technological developments that are/were driven by profit motive and the market.	LAFS.910.L.3.6; LAFS.910.SL.1.1	
05.0	Demonstrate an understanding of the core concepts of technology. – The student will be able to:		
05.01	Identify systems thinking logic and creativity with appropriate compromises in complex real-life problems.	LAFS.910.RI.3.8; LAFS.910.W.2.4	SC.912.N.1.3, 4
05.02	Define technological systems, which are the building blocks of technology and are embedded within larger technological, social, and environmental systems.	LAFS.910.RI.1.3, 2.4; LAFS.910.L.3.6	SC.912.N.1.3, 4
05.03	Identify resources involving trade-offs between competing values, such as availability, cost, desirability, and waste.	LAFS.910.RI.2.4, 3.7; LAFS.910.L.3.6; MAFS.912.A-SSE.1.1, 2	SC.912.N.1.3, 4
05.04	Identify the criteria and constraints of a product or system and determine how they affect the final design and development.	LAFS.910.RI.1.2; 2.4; LAFS.910.L.3.6	SC.912.N.1.3, 4
05.05	List strategies for optimizing a technological process or methodology of designing or making a product, dependent on criteria and constraints.	LAFS.910.W.1.2; LAFS.910.RI.1.1	SC.912.N.1.3, 4

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	05.06 Identify new technologies that create new processes.	LAFS.910.W.3.7, 8,9; LAFS.910.RI.1.2, 3; LAFS.910.L.3.6	SC.912.N.1.3, 4
	05.07 Describe a quality control process to ensure that a product, service or system meets established criteria.	LAFS.910.W.2.4, 6; LAFS.910.SL.2.6; LAFS.910.L.3.6 MAFS.912.N-Q.1.3	SC.912.N.1.1
	05.08 Define a management system as the process of planning, organizing, and controlling work.	LAFS.910.L.3.6; LAFS.910.RI.2.4	SC.912.N.1.2
06.0	Demonstrate an understanding of the relationships among technologies and the connection between technology and other fields of study. – The student will be able to:		
	06.01 Identify technology transfer occurring when a new user applies an existing innovation developed for one purpose in a different function.	LAFS.910.RI.1.1, 3; LAFS.910.L.3.6	SC.912.N.1.4
	06.02 Identify technological innovation resulting when ideas, knowledge, or skills are shared within a technology, among technologies, or across other fields.	LAFS.910.RI.1.1, 3; LAFS.910.L.3.6	SC.912.N.1.5, 6; SC.912.N.4.1, 2
	06.03 Identify technological progresses that promote the advancement of science and mathematics.	LAFS.910.RI.1.1, 3; LAFS.910.L.3.6	SC.912.N.1.4
07.0	Demonstrate an understanding of the cultural, social, economic, and political effects of technology. – The student will be able to:		
	07.01 Identify changes caused by the use of technology ranging from gradual to rapid and from subtle to obvious.	LAFS.910.RI.1.1, 3; LAFS.910.L.3.6	SC.912.N.1.3
	07.02 Classify the use of technology involving weighing the trade-offs between the positive and the negative effects.	LAFS.910.RI.1.3; 3.7; LAFS.910.L.3.6; LAFS.910.W.1.2	SC.912.N.1.3
	07.03 Identify ethical considerations important in the development, selection, and use of technologies.	LAFS.910.L.3.6; LAFS.910.RI.1.2	SC.912.N.1.1, 3
	07.04 List the cultural, social, economic, and political changes caused by the transfer of a technology from one society to another.	LAFS.910.W.2.4, 6; LAFS.910.L.3.6	SC.912.N.1.2
08.0	Demonstrate an understanding of the effects of technology on the environment. – The student will be able to:		
	08.01 Select technologies to conserve water, soil, and energy through such techniques as reusing, reducing and recycling.	LAFS.910.L.3.6; LAFS.910.W.3.7, 8, 9; LAFS.910.RI.1.1, 2, 3	SC.912.L.17.11, 15
	08.02 List trade-offs of developing technologies to reduce the use of resources.	LAFS.910.W.1.2; 2.4; LAFS.910.L.3.6	SC.912.L.17.16
	08.03 Identify technologies devised to reduce the negative consequences of other technologies.	LAFS.910.RI.1.2, 3; LAFS.910.W.2.4; LAFS.910.L.3.6	SC.912.L.17.17

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	08.04 Discuss the implementation of technologies involving the weighing of trade-offs between predicted positive and negative effects on the environment.	LAFS.910.SL.1.1, 2; 2.6; LAFS.910.L.3.6	SC.912.L.17.17
09.0	Demonstrate an understanding of the role of society in the development and use of technology. – The student will be able to:		
	09.01 Collect societal opinions and demands, as well as corporate cultures to use as a basis for deciding whether or not to develop a technology.	LAFS.910.W.3.8; LAFS.910.RI.1.3; 2.4; LAFS.910.L.3.6 MAFS.912.N-Q.1.1, 2; MAFS.912.S-IC.2.4, 5, 6; MAFS.912.S-CP.1.5	SC.912.N.1.1
	09.02 Identify a number of different factors, such as advertising, the strength of the economy, the goals of a company, and the latest fads as contributors to shaping the design of and demand for various technologies.	LAFS.910.RI.1.1, 2, 3; 2.4; LAFS.910.SL.1.2; 2.6; 3.6 MAFS.912.S-IC.2.4, 5, 6	SC.912.N.1.4
10.0	Demonstrate an understanding of the influence of technology on history. – The student will be able to:		
	10.01 Define the history of technology as a powerful force in reshaping the social, cultural, political, and economic landscape.	LAFS.910.RI.2.4; LAFS.910.L.3.6	SC.912.N.2.4
	10.02 Discuss that early in the history of technology, the development of many tools and machines was based not on scientific knowledge but on technological know-how.	LAFS.910.SL.1.1, 2; 2.6; LAFS.910.L.3.6	
11.0	Demonstrate an understanding of the attributes of design. – The student will be able to:		
	11.01 Recognize the design process; including defining a problem, brainstorming, researching and generating ideas, identifying criteria and specifying constraints, exploring possibilities, selecting an approach, developing a design proposal, making a model or prototype, testing and evaluating the design using specifications, refining the design, creating or making it, and communicating processes and results.	LAFS.910.L.3.6; LAFS.910.RI.4.10; LAFS.910.SL.1.1; 2.6	SC.912.N.1.1
	11.02 Restate design problems that are seldom presented in a clearly defined form.	LAFS.910.L.2.4; 3.6 LAFS.910.SL.2.6	SC.912.N.1.1
	11.03 Check and critique a design continually, and improve and revise the idea of the design as needed.	LAFS.910.RI.3.8; LAFS.910.W.2.5; LAFS.910.L.3.6	SC.912.N.1.1
	11.04 List competing requirements of a design, such as criteria, constraints, and efficiency.	LAFS.910.W.1.2; 2.4; LAFS.910.L.3.6	SC.912.N.1.1
12.0	Demonstrate an understanding of engineering design. – The student will be able to:		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
12.01	Identify design principles used to evaluate existing designs, to collect data, and to guide the design process.	LAFS.910.W.3.7, 8, 9; 4.10; LAFS.910.RI.1.3; LAFS.910.L.3.6 MAFS.912.N-Q.1.1, 2, 3	SC.912.N.1.1
12.02	Describe the influence of personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly on the Engineering Design process.	LAFS.910.RI.2.4; 3.7; LAFS.910.W.4.10; LAFS.910.L.3.6	SC.912.N.1.1, 7
12.03	Construct a prototype or a working model used to test a design concept by making actual observations and necessary adjustments.		SC.912.N.1.1, 7
12.04	Identify factors taken into account in the process of engineering.	LAFS.910.W.1.2; LAFS.910.L.3.6	SC.912.N.1.1, 7
13.0	Demonstrate an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving. – The student will be able to:		
13.01	Define research and development as a specific problem solving approach that is used intensively in business and industry to prepare devices and systems for the marketplace.	LAFS.910.W.1.2; 3.7, 8, 9; LAFS.910.L.3.6	SC.912.N.1.1
13.02	Identify research needed to solve technological problems.	LAFS.910.RI.1.1, 2, 3; 2.4; LAFS.910.L.3.6	SC.912.N.1.1
13.03	Differentiate between technological and non-technological problems, and identify which problems can be solved using technology.	LAFS.910.RI.2.4; 3.8; LAFS.910.L.3.6	SC.912.N.1.1, 4
13.04	Utilize a multidisciplinary approach to solving technological problems.	LAFS.910.W.2.6; 3.7, 8, 9; LAFS.910.L.3.6	SC.912.N.1.1
14.0	Demonstrate the abilities to apply the design process. – The student will be able to:		
14.01	Identify the design problem to solve and decide whether or not to address it.	LAFS.910.W.3.7; 4.10; LAFS.910.RI.1.2; LAFS.910.L.3.6	SC.912.N.1.1
14.02	List criteria and constraints and determine how these will affect the design process.	LAFS.910.W.1.2; 2.4; LAFS.910.L.3.6	SC.912.N.1.1
14.03	Refine a design by using prototypes and modeling to ensure quality, efficiency, and productivity of the final product.		SC.912.N.1.1
14.04	Evaluate the design solution using conceptual, physical, and mathematical models at various intervals of the design process in order to check for proper design and to note areas where improvements are needed.	LAFS.910.L.3.6; LAFS.910.W.1.2; 2.4; LAFS.910.RI.4.10	SC.912.N.1.1
14.05	Develop a product or system using a design process.	LAFS.910.W.3.7, 8, 9; LAFS.910.RI.4.10; LAFS.910.L.3.6	SC.912.N.1.1

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	14.06 Evaluate final solutions and communicate observations, processes, and results of the entire design process, using verbal, graphic, quantitative, virtual, and written means, in addition to three-dimensional models.	LAFS.910.SL.2.4, 5, 6; LAFS.910.W.2.4, 6; LAFS.910.L.3.6; LAFS.910.RI.4.10 MAFS.912.A-CED.1.3, 4	SC.912.N.1.1
15.0	Demonstrate the abilities to use and maintain technological products and systems. – The student will be able to:		
	15.01 Document processes and procedures and communicate them to different audiences using appropriate oral and written techniques.	LAFS.910.SL.2.4, 5, 6; LAFS.910.W.2.4, 6; LAFS.910.L.3.6; LAFS.910.RI.4.10	SC.912.N.1.1
	15.02 Diagnose a system that is malfunctioning and use tools, materials, machines, and knowledge to repair it.		SC.912.N.1.1
	15.03 Troubleshoot, analyze, and maintain systems to ensure safe and proper function and precision.		SC.912.N.1.1
	15.04 Operate systems so that they function in the way they were designed.		SC.912.N.1.1
	15.05 Use computers and calculators to access, retrieve, organize, process, maintain, interpret, and evaluate data and information in order to communicate.	LAFS.910.W.2.6; LAFS.910.SL.2.4, 5, 6; LAFS.910.RI.4.10 MAFS.912.A-CED.1.3, 4; MAFS.912.N-Q.1.1, 2, 3; MAFS.912.A-SSE.1.1, 2	SC.912.N.1.1
16.0	Demonstrate the abilities to assess the impact of products and systems. – The student will be able to:		
	16.01 Collect information and evaluate its quality.	LAFS.910.W.3.8; LAFS.910.L.3.6; LAFS.910.RI.4.10	SC.912.N.1.1
	16.02 Synthesize data, analyze trends, and draw conclusions regarding the effect of technology on the individual, society, and the environment.	LAFS.910.RI.1.1, 3; 2.4; 3.8; LAFS.910.L.3.6 MAFS.912.N-Q.1.1, 2, 3; MAFS.912.A-SSE.1.1, 2	SC.912.N.1.1
	16.03 Define assessment techniques, such as trend analysis and experimentation to make decisions about the future development of technology.	LAFS.910.L.3.6 MAFS.912.N-Q.1.1, 2, 3	SC.912.N.1.1
	16.04 Identify forecasting techniques to evaluate the results of altering natural systems.	LAFS.910.RI.1.2; 2.4; LAFS.910.L.3.6	SC.912.N.1.1

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
19.0	Demonstrate an understanding of and be able to select and use energy and power technologies. – The student will be able to:		
19.01	Discuss how energy cannot be created nor destroyed; however, it can be converted from one form to another.	LAFS.910.SL.1.1, 2; 3.6; LAFS.910.L.3.6 MAFS.912.A-SSE.1.1, 2; MAFS.912.A-CED.1.3, 4	SC.912.P.10.1
19.02	Categorize types of energy into major forms: thermal, radiant, electrical, mechanical, chemical, nuclear, and others.	LAFS.910.W1.2; LAFS.910.L3.6	SC.912.P.10.1
19.03	Classify energy resources as renewable or nonrenewable.	LAFS.910.W.1.2; LAFS.910.L.3.6 MAFS.912.A-SSE.1.1, 2; MAFS.912.A-CED.1.3, 4	SC.912.L.17.11
19.04	Construct a power system having a source of energy, a process, and loads.	LAFS.910.W.3.8; LAFS.910.L.3.6; LAFS.910.RI.4.10	
20.0	Demonstrate an understanding of and be able to select and use information and communication technologies. – The student will be able to:		
20.01	Discuss information and communication technologies including the inputs, processes, and outputs associated with sending and receiving information.	LAFS.910.SL.1.1, 2; 2.6; LAFS.910.L.3.6	SC.912.N.1.1
20.02	Classify information and communication systems that allow information to be transferred as human to human, human to machine, machine to human, or machine to machine.	LAFS.910.W.1.2; LAFS.910.L.3.6; LAFS.910.RI.4.10	SC.912.N.1.1, 4
20.03	Use information and communication systems to inform, persuade, entertain, control, manage, and educate.	LAFS.910.L.3.6; LAFS.910.SL.1.1, 2; 2.4, 5, 6; LAFS.910.RI.4.10	SC.912.N.1.1, 4
20.04	Identify components of a communications system, including source, encoder, transmitter, receiver, decoder, storage, retrieval, and destination.	LAFS.910.L.3.6; LAFS.910.W.1.2	SC.912.N.1.1
20.05	Identify many ways to communicate information, such as graphic and electronic means.	LAFS.910.L.3.6; LAFS.910.SL.2.4, 5;	SC.912.N.1.1, 4
20.06	Communicate technological knowledge and processes using symbols, measurement, conventions, icons, graphic images, and languages that incorporate a variety of visual, auditory, and tactile stimuli.	LAFS.910.SL.2.5, 6; LAFS.910.L.3.6	SC.912.N.1.1
21.0	Demonstrate an understanding of and be able to select and use transportation technologies. – The student will be able to:		
21.01	Analyze the vital role played by transportation in the operation of other technologies, such as manufacturing, construction, communication, health and safety, and agriculture.	LAFS.910.RI.1.1, 3; LAFS.910.W.2.4; 4.10; LAFS.910.SL.2.4, 5, 6; LAFS.910.L.3.6	

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	21.02 Define intermodalism as the use of different modes of transportation, such as highways, railways, and waterways as part of an interconnected system that can move people and goods easily from one mode to another.	LAFS.910.L.3.6; LAFS.910.W.4.10; LAFS.910.RI.2.4	
	21.03 Discuss how transportation services and methods have led to a population that is regularly on the move.	LAFS.910.SL.1.1, 2; LAFS.910.RI.1.1; LAFS.910.L.3.6	SC.912.L.17.18
	21.04 Identify processes and innovative techniques involved in the design of intelligent and non-intelligent transportation systems.	LAFS.910.RI.1.1, 3; LAFS.910.L.3.6	
22.0	Demonstrate an understanding of and be able to select and use manufacturing technologies. – The student will be able to:		
	22.01 Service products to keep them in good operating condition.		SC.912.N.1.1
	22.02 Classify materials based on their qualities as natural, synthetic, or mixed.	LAFS.910.W.1.2; 2.4; LAFS.910.L.3.6; LAFS.910.RI.4.10	SC.912.N.1.1
	22.03 Classify goods as durable goods designed to operate for a long period of time, or non-durable goods designed to operate for a short period of time.	LAFS.910.W.1.2; 2.4; LAFS.910.L.3.6; LAFS.910.RI.4.10	SC.912.N.1.1
	22.04 Identify and classify manufacturing systems into types, such as customized production, batch production, and continuous production.	LAFS.910.W.1.2; 2.4; LAFS.910.L.3.6; LAFS.910.RI.4.10	SC.912.N.1.1
	22.05 Discuss the interchangeability of parts to increase the effectiveness of manufacturing processes.	LAFS.910.SL.1.1; 2.6; LAFS.910.L.3.6	SC.912.N.1.1
	22.06 Employ marketing techniques involving establishing a product's identity, conducting research on its potential, advertising it, distributing it, and selling it.	LAFS.910.W.4.10	SC.912.N.1.1
23.0	Demonstrate an understanding of and be able to select and use construction technologies. – The student will be able to:		
	23.01 Define infrastructure as the underlying base or basic framework of a system.	LAFS.910.L.3.6; LAFS.910.W.4.10; LAFS.910.RI.2.4 MAFS.912.A-SSE.1.1, 2; MAFS.912.A-CED.1.3, 4	
	23.02 Identify a variety of processes and procedures used in constructing structures.	LAFS.910.W.1.2; 2.4; LAFS.910.L.3.6; LAFS.910.R.I4.10	SC.912.N.1.4
	23.03 Identify requirements involved in the design of structures.	LAFS.910.W.1.2; 2.4; LAFS.910.L.3.6; LAFS.910.RI.1.1; 4.10	SC.912.N.1.4

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	23.04 Recommend maintenance, alterations, or renovations to improve a structure or alter its intended use.	LAFS.910.W.1.2; 2.4; LAFS.910.L.3.6, LAFS.910.SL.1.1, 2; 2.4	SC.912.N.1.4
	23.05 Identify prefabricated materials used in some structures.	LAFS.910.W.1.2; 2.4; LAFS.910.L.3.6; LAFS.910.RI.1.1	SC.912.N.1.4
24.0	Demonstrate safe and appropriate use of tools and machines in engineering technology. – The student will be able to:		
	24.01 Select appropriate tools, procedures, and/or equipment.		SC.912.N.1.1
	24.02 Demonstrate the safe usage of appropriate tools, procedures, and operation of equipment.		SC.912.N.1.1
	24.03 Follow laboratory safety rules and procedures.		SC.912.N.1.1
	24.04 Demonstrate good housekeeping at workstation within total laboratory.		SC.912.N.1.1
	24.05 Identify color-coding safety standards.	LAFS.910.W.1.2; 2.4; LAFS.910.L.3.6; LAFS.910.RI.1.1	SC.912.N.1.1
	24.06 Explain fire prevention and safety precautions and practices for extinguishing fires.	LAFS.910.W.1.2; 2.4; LAFS.910.L.3.6, LAFS.910.RI.4.10, LAFS.910.SL.1.1, 2; 2.6	SC.912.N.1.1
	24.07 Identify harmful effects/potential dangers of familiar hazardous substances/devices to people and the environment.	LAFS.910.W.1.2; 2.4; LAFS.910.L.3.6; LAFS.910.RI.4.10	SC.912.N.1.1
25.0	Demonstrate the ability to properly identify, organize, plan, and allocate resources. – The student will be able to:		
	25.01 Demonstrate the ability to select goal-relevant activities, rank them, allocate time, and prepare and follow schedules.	LAFS.910.W.1.2; 2.4; LAFS.910.L.3.6, LAFS.910.SL.1.2; 2.4, 5, 6	SC.912.N.1.1
	25.02 Use or prepare budgets, make forecasts, keep records, and make adjustments to meet objectives.		SC.912.N.1.1
	25.03 Demonstrate the ability to acquire, store, allocate, and use materials or space efficiently.		SC.912.N.1.1
	25.04 Display knowledge of the efficient use of human resources.	LAFS.910.W.2.6; 4.10; LAFS.910.SL.2.4, 5, 6; LAFS.910.L.3.6	SC.912.N.1.1
26.0	Demonstrate the functional characteristics of the engineering design team. – The student will be able to:		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
26.01	Describe work breakdown organization.	LAFS.910.W.1.2; 2.4; LAFS.910.SL.1.2; 2.4, 5, 6; LAFS.910.L.3.6, LAFS.910.RI.1.1	
26.02	Describe work group organization schemes including functional and hierarchical schemes.	LAFS.910.W.1.2; 2.4; LAFS.910.SL.1.2; 2.4, 5, 6; LAFS.910.L.3.6, LAFS.910.RI.1.1	
26.03	Describe the function of management in general and project management in particular.	LAFS.910.W.1.2; 2.4; LAFS.910.SL.1.2; 2.4, 5, 6; LAFS.910.L.3.6, LAFS.910.RI.1.2	
26.04	Describe a typical design project team structure.	LAFS.910.W.1.2; 2.4; LAFS.910.SL.1.2; 2.4, 5, 6; LAFS.910.L.3.6, LAFS.910.RI.1.1	
26.05	Outline a research methodology.	LAFS.910.W.1.2; 2.4; LAFS.910.L.3.6	SC.912.N.1.1
26.06	Demonstrate brainstorming techniques.	LAFS.910.W.1.2; 2.4; 4.10; LAFS.910.L.3.6; LAFS.910.SL.2.6	SC.912.N.1.1, 3
27.0	Demonstrate technical knowledge and skills in the processes and systems related to engineering. – The student will be able to:		
27.01	Assemble, operate, and identify the parts of a fluid system.	LAFS.910.W1.2; 2.4; 4.10; LAFS.910.L3.6; LAFS.910.RI4.10	
27.02	Demonstrate and apply principles of force, work, rate, resistance, energy, power, and force transformers relating to fluid systems.	LAFS.910.W.1.2; 2.4; 4.10; LAFS.910.L.3.6; LAFS.910.RI.4.10 MAFS.912.G-GMD.1.3; MAFS.912.A-SSE.1.1, 2; MAFS.912.A-CED.1.3, 4	SC.912.N.1.1; SC.912.P.10.3
27.03	Assemble, operate, and identify the parts of a thermal system.	LAFS.910.W.1.2; 2.4; 4.10; LAFS.910.L.3.6; LAFS.910.RI.4.10	SC.912.P.10.4, 7
27.04	Demonstrate and apply principles of force, work, rate, resistance, energy, power, and force transformers relating to thermal systems.	LAFS.910.W.1.2; 2.4; 4.10; LAFS.910.L.3.6; LAFS.910.RI.4.10 MAFS.912.A-SSE.1.1, 2; MAFS.912.A-CED.1.3, 4	SC.912.P.10.4

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
27.05	Assemble, operate, and identify the parts of an electrical system.	LAFS.910.W.1.2; 2.4; 4.10; LAFS.910.L.3.6; LAFS.910.RI.4.10	SC.912.P.10.15
27.06	Demonstrate and apply principles of force, work, rate, resistance, energy, power, and force transformers relating to electrical systems.	LAFS.910.W.1.2; 2.4; 4.10; LAFS.910.L.3.6; LAFS.910.RI.4.10 MAFS.912.A-SSE.1.1, 2; MAFS.912.A-CED.1.3, 4	SC.912.P.10.3, 15
27.07	Assemble, operate, and identify the parts of a mechanical system.	LAFS.910.W.1.2; 2.4; 4.10; LAFS.910.L.3.6; LAFS.910.RI.4.10	
27.08	Demonstrate and apply principles of force, work, rate, resistance, energy, power, and force transformers relating to mechanical systems.	LAFS.910.W.1.2; 2.4; 4.10; LAFS.910.L.3.6; LAFS.910.RI.4.10 MAFS.912.A-SSE.1.1, 2; MAFS.912.A-CED.1.3, 4	SC.912.N.1.1
28.0	Demonstrate technical knowledge and skills in the designing, engineering, and analysis of constructed works. – The student will be able to:		
28.01	Define terminology associated with engineering products and systems.	LAFS.910.L.3.6; LAFS.910.RI.2.4	SC.912.N.1.1
28.02	Define and describe the experimental method as it is applied to design.	LAFS.910.L.3.6; LAFS.910.RI.2.4	SC.912.N.1.1
28.03	Describe simulation.	LAFS.910.SL.1.1; LAFS.910.L.3.6	SC.912.N.1.1
28.04	Prepare a model of a design solution to an engineering problem.		SC.912.N.1.1
28.05	Prepare a graphical solution to an engineering problem.		SC.912.N.1.1
28.06	Prepare a mathematical solution to an engineering problem (using either a calculator or computer).		SC.912.N.1.1
28.07	Present a technical report on an engineering design problem, concept or issue.	LAFS.910.W.3.7, 8, 9; LAFS.910.RI.1.1, 2, 3; 4.10; LAFS.910.L.3.6	SC.912.N.1.1

Florida Department of Education
Student Performance Standards

Course Title: **Engineering Technology II**
Course Number: **8600670**
Course Credit: **1**

Course Description:
This program provides students with an intermediate understanding of the knowledge, human relations, and technological skills found today in technical professions.

Florida Standards			Correlation to CTE Program Standard #
01.0	Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Engineering Technology.		
	01.01 Key Ideas and Details		
	01.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. LAFS.910.RST.1.1	
	01.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.910.RST.1.2	
	01.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.910.RST.1.3	
	01.02 Craft and Structure		
	01.02.1	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. LAFS.910.RST.2.4	
	01.02.2	Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). LAFS.910.RST.2.5	
	01.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. LAFS.910.RST.2.6	

Florida Standards			Correlation to CTE Program Standard #
01.03	Integration of Knowledge and Ideas		
	01.03.1	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. LAFS.910.RST.3.7	
	01.03.2	Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. LAFS.910.RST.3.8	
	01.03.3	Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. LAFS.910.RST.3.9	
01.04	Range of Reading and Level of Text Complexity		
	01.04.1	By the end of grade 9, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	01.04.2	By the end of grade 10, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 9–10 text complexity band independently and proficiently. LAFS.910.RST.4.10	
02.0	Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Engineering Technology.		
02.01	Text Types and Purposes		
	02.01.1	Write arguments focused on discipline-specific content. LAFS.910.WHST.1.1	
	02.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.910.WHST.1.2	
02.02	Production and Distribution of Writing		
	02.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.910.WHST.2.4	
	02.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.910.WHST.2.5	

Florida Standards			Correlation to CTE Program Standard #
	02.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. LAFS.910.WHST.2.6	
02.03	Research to Build and Present Knowledge		
	02.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.910.WHST.3.7	
	02.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. LAFS.910.WHST.3.8	
	02.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.910.WHST.3.9	
02.04	Range of Writing		
	02.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.910.WHST.4.10	
03.0	Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Engineering Technology.		
03.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1		
03.02	Reason abstractly and quantitatively. MAFS.K12.MP.2.1		
03.03	Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1		
03.04	Model with mathematics. MAFS.K12.MP.4.1		
03.05	Use appropriate tools strategically. MAFS.K12.MP.5.1		

Florida Standards	Correlation to CTE Program Standard #
03.06 Attend to precision. MAFS.K12.MP.6.1	
03.07 Look for and make use of structure. MAFS.K12.MP.7.1	
03.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
04.0	Demonstrate an understanding of the characteristics and scope of technology. – The student will be able to:		
04.01	Illustrate the nature and development of technological knowledge and processes.	LAFS.910.W.4.10; LAFS.910.L.3.6	SC.912.N.1.1
04.02	Graph the rapid increase in the rate of technological development and diffusion.	LAFS.910.W.4.10; LAFS.910.L.3.6	SC.912.N.1.1
04.03	Conduct specific goal-directed research related to inventions and innovations.	LAFS.910.W.3.7, 8, 9; LAFS.910.RI.1.1, 2, 3; LAFS.910.L.3.6	SC.912.N.1.1
04.04	Evaluate current technological developments that are/were driven by profit motive and the market.	LAFS.910.RI.3.8; 4.10; LAFS.910.L.3.6; LAFS.910.SL.1.1	SC.912.N.1.1
05.0	Demonstrate an understanding of the core concepts of technology. – The student will be able to:		
05.01	Apply systems thinking logic and creativity with appropriate compromises in complex real-life problems.		SC.912.N.1.7
05.02	Discuss technological systems, which are the building blocks of technology and are embedded within larger technological, social, and environmental systems.	LAFS.910.L.3.6; LAFS.910.SL.1.1, 2	
05.03	Assess the stability of a technological system and its influence by all of the components in the system, especially those in the feedback loop.	LAFS.910.RI.3.8; 4.10; LAFS.910.L.3.6; LAFS.910.SL.1.1	SC.912.N.1.4
05.04	Select resources involving trade-offs between competing values, such as availability, cost, desirability, and waste.	LAFS.910.RI.2.4; 3.7; LAFS.910.L.3.6;	SC.912.N.1.4
05.05	Identify the criteria and constraints of a product or system and determine how they affect the final design and development.	LAFS.910.RI.1.2; 2.4; LAFS.910.L.3.6	SC.912.N.1.4

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	05.06 Implement strategies for optimizing a technological process or methodology of designing or making a product, dependent on criteria and constraints.		SC.912.N.1.1
	05.07 Discuss new technologies that create new processes.	LAFS.910.L.3.6; LAFS.910.SL.1.1, 2; 2.6	SC.912.N.2.4
	05.08 Implement a quality control process to ensure that a product, service or system meets established criteria.		SC.912.N.1.1
	05.09 Organize a management system as the process of planning, organizing, and controlling work.	LAFS.910.W.1.2; 4.10; LAFS.910.L.3.6	SC.912.N.1.1
06.0	Demonstrate an understanding of the relationships among technologies and the connection between technology and other fields of study. – The student will be able to:		
	06.01 Discuss technology transfer occurring when a new user applies an existing innovation developed for one purpose in a different function.	LAFS.910.L.3.6; LAFS.910.SL.1.1, 2; 2.6	SC.912.N.2.5
	06.02 Explain technological innovation resulting when ideas, knowledge, or skills are shared within a technology, among technologies, or across other fields.	LAFS.910.L.3.6; LAFS.910.SL.1.1, 2; 2.6; LAFS.910.W.1.2; 2.4; 4.10	SC.912.N.2.5
	06.03 Discuss technological progresses that promote the advancement of science and mathematics.	LAFS.910.L.3.6; LAFS.910.SL.1.1, 2; 2.6; LAFS.910.W.1.2; 2.4; 4.10	SC.912.N.2.4
07.0	Demonstrate an understanding of the cultural, social, economic, and political effects of technology. – The student will be able to:		
	07.01 Discuss changes caused by the use of technology ranging from gradual to rapid and from subtle to obvious.	LAFS.910.L.3.6; LAFS.910.SL.1.1, 2; 2.6; LAFS.910.W.1.2; 2.4; 4.10	SC.912.N.4.2
	07.02 Compare the use of technology involving weighing the trade-offs between the positive and the negative effects.	LAFS.910.RI.1.2; 4.10; LAFS.910.L.3.6	SC.912.N.4.2
	07.03 Discuss ethical considerations important in the development, selection, and use of technologies.	LAFS.910.L.3.6; LAFS.910.SL.1.1, 2; 2.6; LAFS.910.W.1.2; 2.4; 4.10	SC.912.N.4.2
	07.04 Debate the cultural, social, economic, and political changes caused by the transfer of a technology from one society to another.	LAFS.910.W.1.1; LAFS.910.SL.2.4; LAFS.910.L.3.6	SC.912.N.4.2
08.0	Demonstrate an understanding of the effects of technology on the environment. – The student will be able to:		
	08.01 Compare trade-offs of developing technologies to reduce the use of resources.	LAFS.910.RI.1.2; 4.10; LAFS.910.L.3.6	SC.912.L.17.11, 15
	08.02 Compare and contrast the alignment of technological processes with natural processes to maximize performance and reduce negative impacts on the environment.	LAFS.910.RI.1.2; 4.10; LAFS.910.L.3.6	SC.912.L.17.17

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
08.03	Assess technologies devised to reduce the negative consequences of other technologies.	LAFS.910.RI.3.7, 8; LAFS.910.L.3.6; LAFS.910.W.2.4	SC.912.L.17.17
08.04	Make decisions about the implementation of technologies involving the weighing of trade-offs between predicted positive and negative effects on the environment.		SC.912.L.17.13, 17
09.0	Demonstrate an understanding of the role of society in the development and use of technology. – The student will be able to:		
09.01	Consider societal opinions and demands, as well as corporate cultures to use as a basis for deciding whether or not to develop a technology.		SC.912.N.1.1
09.02	Consider a number of different factors, such as advertising, the strength of the economy, the goals of a company, and the latest fads as contributors to shaping the design of and demand for various technologies.		SC.912.N.1.1
10.0	Demonstrate an understanding of the influence of technology on history. – The student will be able to:		
10.01	Research how the evolution of civilization has been directly affected by, and has in turn affected, the development and use of tools and materials.	LAFS.910.W.3.7, 8, 9; 4.10; LAFS.910.RI.1.1, 2, 3; LAFS.910.L.3.6	
10.02	Define the history of technology as a powerful force in reshaping the social, cultural, political, and economic landscape.	LAFS.910.L.3.6; LAFS.910.RI.2.4; LAFS.910.W.1.2; 2.4	
10.03	Debate that early in the history of technology, the development of many tools and machines was based not on scientific knowledge but on technological know-how.	LAFS.910.W.1.1; 2.4; 4.10; LAFS.910.RI.1.2; 3.7; LAFS.910.L.3.6	
10.04	Define the Iron Age as the use of iron and steel as the primary materials for tools.	LAFS.910.W.1.1; 2.4; 4.10; LAFS.910.RI.1.2; 3.7; LAFS.910.L.3.6	
10.05	Define the Middle Ages and its development of many technological devices that produced long-lasting effects on technology and society.	LAFS.910.W.1.1; 2.4; 4.10; LAFS.910.RI.1.2; 3.7; LAFS.910.L.3.6	
10.06	Define the Renaissance, a time of rebirth of the arts and humanities, as an important development in the history of technology.	LAFS.910.W.1.1; 2.4; 4.10; LAFS.910.RI.1.2; 3.7; LAFS.910.L.3.6	
10.07	Discuss the Industrial Revolution and the development of continuous manufacturing, sophisticated transportation and communication systems, advanced construction practices, and improved education and leisure time.	LAFS.910.SL.1.1, 2; 2.6; LAFS.910.L.3.6	
10.08	Define the Information Age and its placement of emphasis on the processing and exchange of information.	LAFS.910.W.1.1; 2.4; 4.10; LAFS.910.RI.1.2; 3.7; LAFS.910.L.3.6	

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
11.0	Demonstrate an understanding of the attributes of design. – The student will be able to:		
11.01	Describe the design process; including defining a problem, brainstorming, researching and generating ideas, identifying criteria and specifying constraints, exploring possibilities, selecting an approach, developing a design proposal, making a model or prototype, testing and evaluating the design using specifications, refining the design, creating or making it, and communicating processes and results.	LAFS.910.L.3.6; LAFS.910.RI.4.10; LAFS.910.SL.1.1, 2; 2.6	SC.912.N.1.1
11.02	Translate design problems that are seldom presented in a clearly defined form.	LAFS.910.W.1.2; 2.4, 5; 4.10; LAFS.910.SL.1.1, 3; 2.6; LAFS.910.L.3.6	SC.912.N.1.1
11.03	Evaluate a design continually, and improve and revise the idea of the design as needed.	LAFS.910.RI.1.3; 2.4; 4.10; LAFS.910.L.3.6	SC.912.N.1.1
11.04	Analyze competing requirements of a design, such as criteria, constraints, and efficiency.	LAFS.910.RI.1.3; 2.4; 4.10; LAFS.910.L.3.6	SC.912.N.1.1
12.0	Demonstrate an understanding of engineering design. – The student will be able to:		
12.01	Investigate design principles used to evaluate existing designs, to collect data, and to guide the design process.	LAFS.910.W.3.7, 8, 9; 4.10; LAFS.910.RI.1.3; LAFS.910.L3.6	SC.912.N.1.1
12.02	Examine the influence of personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly on the Engineering Design process.	LAFS.910.W.3.7, 8, 9; 4.10; LAFS.910.RI.1.3; LAFS.910.L.3.6	SC.912.N.1.1
12.03	Construct a prototype or a working model used to test a design concept by making actual observations and necessary adjustments.		SC.912.N.1.1
12.04	Evaluate factors taken into account in the process of engineering.	LAFS.910.RI.1.3; 2.4; 4.10; LAFS.910.L.3.6	SC.912.N.1.1
13.0	Demonstrate an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving. – The student will be able to:		
13.01	Employ research and development as a specific problem solving approach that is used intensively in business and industry to prepare devices and systems for the marketplace.	LAFS.910.W.3.7, 8, 9; 4.10; LAFS.910.RI.4.10; LAFS.910.L.3.6	SC.912.N.1.1
13.02	Conduct research needed to solve technological problems.	LAFS.910.W.3.7, 8, 9; 4.10; LAFS.910.RI.4.10; LAFS.910.L.3.6	SC.912.N.1.1
13.03	Differentiate between technological and non-technological problems, and identify which problems can be solved using technology.	LAFS.910.RI.1.2; 2.4; 3.7; 4.10; LAFS.910.L.3.6	SC.912.N.1.1

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	13.04 Utilize a multidisciplinary approach to solving technological problems.	LAFS.910.W.3.7, 8, 9; 4.10; LAFS.910.RI.4.10; LAFS.910.L.3.6	SC.912.N.1.1
14.0	Demonstrate the abilities to apply the design process. – The student will be able to:		
	14.01 Interpret the design problem to solve and decide whether or not to address it.	LAFS.910.RI.4.10; LAFS.910.L.3.6	SC.912.N.1.1
	14.02 Evaluate criteria and constraints and determine how these will affect the design process.	LAFS.910.RI.1.3; 2.4; 4.10; LAFS.910.L.3.6	SC.912.N.1.1
	14.03 Refine a design by using prototypes and modeling to ensure quality, efficiency, and productivity of the final product.		SC.912.N.1.1
	14.04 Evaluate the design solution using conceptual, physical, and mathematical models at various intervals of the design process in order to check for proper design and to note areas where improvements are needed.	LAFS.910.L.3.6; LAFS.910.W.1.2; 2.4	SC.912.N.1.1
	14.05 Produce a product or system using a design process.		SC.912.N.1.1
	14.06 Evaluate final solutions and communicate observations, processes, and results of the entire design process, using verbal, graphic, quantitative, virtual, and written means, in addition to three-dimensional models.	LAFS.910.SL.2.4, 5, 6; LAFS.910.W.2.4, 6; LAFS.910.L.3.6; LAFS.910.RI.4.10	SC.912.N.1.1
15.0	Demonstrate the abilities to use and maintain technological products and systems. – The student will be able to:		
	15.01 Document processes and procedures and communicate them to different audiences using appropriate oral and written techniques.	LAFS.910.SL.2.4, 5, 6; LAFS.910.W.2.4, 6; LAFS.910.L.3.6	SC.912.N.1.1
	15.02 Diagnose a system that is malfunctioning and use tools, materials, machines, and knowledge to repair it.		SC.912.N.1.1
	15.03 Troubleshoot, analyze, and maintain systems to ensure safe and proper function and precision.		SC.912.N.1.1
	15.04 Operate systems so that they function in the way they were designed.		SC.912.N.1.1
	15.05 Use computers and calculators to access, retrieve, organize, process, maintain, interpret, and evaluate data and information in order to communicate.	LAFS.910.W.2.6; LAFS.910.SL.2.4, 5, 6; LAFS.910.RI.4.10	SC.912.N.1.1
16.0	Demonstrate the abilities to assess the impact of products and systems. – The student will be able to:		
	16.01 Collect information and evaluate its quality.	LAFS.910.W.3.8; LAFS.910.L.3.6; LAFS.910.RI.4.10	SC.912.N.1.1

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	16.02 Synthesize data, analyze trends, and draw conclusions regarding the effect of technology on the individual, society, and the environment.	LAFS.910.RI.1.1, 3; 2.4; 3.8; LAFS.910.L.3.6 MAFS.912.N-Q.1.1, 2, 3; MAFS.912.A-SSE.1.1, 2	SC.912.N.1.1
	16.03 Apply assessment techniques, such as trend analysis and experimentation to make decisions about the future development of technology.		SC.912.N.1.1
	16.04 Design forecasting techniques to evaluate the results of altering natural systems.	LAFS.910.W.1.2, LAFS.910.RI.1.2; 2.4; LAFS.910.L.3.6	SC.912.N.1.1
19.0	Demonstrate an understanding of and be able to select and use energy and power technologies. – The student will be able to:		
	19.01 Discuss how energy cannot be created nor destroyed; however, it can be converted from one form to another.	LAFS.910.SL.1.1, 2; 2.6; LAFS.910.L.3.6	SC.912.P.10.1
	19.02 Categorize types of energy into major forms: thermal, radiant, electrical, mechanical, chemical, nuclear, and others.	LAFS.910.W.1.2; LAFS.910.L.3.6	SC.912.P.10.1
	19.03 Classify energy resources as renewable or nonrenewable.	LAFS.910.W.1.2; LAFS.910.L.3.6	SC.912.L.17.11
	19.04 Construct a power system having a source of energy, a process, and loads.		SC.912.N.1.1
20.0	Demonstrate an understanding of and be able to select and use information and communication technologies. – The student will be able to:		
	20.01 Discuss information and communication technologies including the inputs, processes, and outputs associated with sending and receiving information.	LAFS.910.SL.1.1, 2; 2.6; LAFS.910.L.3.6	SC.912.N.1.1
	20.02 Classify information and communication systems that allow information to be transferred as human to human, human to machine, machine to human, or machine to machine.	LAFS.910.W.1.2; LAFS.910.L.3.6	SC.912.N.1.1
	20.03 Use information and communication systems to inform, persuade, entertain, control, manage, and educate.	LAFS.910.L.3.6; LAFS.910.SL.1.1, 2; 2.4, 5, 6	SC.912.N.1.1
	20.04 Identify components of a communications system, including source, encoder, transmitter, receiver, decoder, storage, retrieval, and destination.	LAFS.910.L.3.6; LAFS.910.W.1.2	SC.912.N.1.1
	20.05 Identify many ways to communicate information, such as graphic and electronic means.	LAFS.910.L.3.6, LAFS.910.SL.2.4, 5	SC.912.N.1.1
	20.06 Communicate technological knowledge and processes using symbols, measurement, conventions, icons, graphic images, and languages that incorporate a variety of visual, auditory, and tactile stimuli.	LAFS.910.SL.2.5, 6; LAFS.910.L.3.6	SC.912.N.1.1

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
21.0	Demonstrate an understanding of and be able to select and use transportation technologies. – The student will be able to:		
21.01	Analyze the vital role played by transportation in the operation of other technologies, such as manufacturing, construction, communication, health and safety, and agriculture.	LAFS.910.RI.1.1, 3; LAFS.910.W.2.4; 4.10; LAFS.910.SL.2.4, 5, 6; LAFS.910.L.3.6	
21.02	Define intermodalism as the use of different modes of transportation, such as highways, railways, and waterways as part of an interconnected system that can move people and goods easily from one mode to another.	LAFS.910.L.3.6; LAFS.910.W.4.10; LAFS.910.RI.2.4	
21.03	Discuss how transportation services and methods have led to a population that is regularly on the move.	LAFS.910.SL.1.1, 2; LAFS.910.RI.1.1; LAFS.910.L.3.6	
21.04	Identify processes and innovative techniques involved in the design of intelligent and non-intelligent transportation systems.	LAFS.910.RI.1.1, 3; LAFS.910.L.3.6	
22.0	Demonstrate an understanding of and be able to select and use manufacturing technologies. – The student will be able to:		
22.01	Service products to keep them in good operating condition.		SC.912.N.1.1
22.02	Classify materials based on their qualities as natural, synthetic, or mixed.	LAFS.910.W.1.2; 2.4; LAFS.910.L.3.6	SC.912.P.8.1
22.03	Classify goods as durable goods designed to operate for a long period of time, or non-durable goods designed to operate for a short period of time.	LAFS.910.W.1.2; 2.4; LAFS.910.L.3.6	
22.04	Identify and classify manufacturing systems into types, such as customized production, batch production, and continuous production.	LAFS.910.W.1.2; 2.4; LAFS.910.L.3.6	
22.05	Discuss the interchangeability of parts to increase the effectiveness of manufacturing processes.	LAFS.910.SL.1.1; 2.6; LAFS.910.L.3.6	
22.06	Employ marketing techniques involving establishing a product's identity, conducting research on its potential, advertising it, distributing it, and selling it.		
23.0	Demonstrate an understanding of and be able to select and use construction technologies. – The student will be able to:		
23.01	Define infrastructure as the underlying base or basic framework of a system.	LAFS.910.L.3.6; LAFS.910.W.4.10; LAFS.910.RI.2.4	
23.02	Identify a variety of processes and procedures used in constructing structures.	LAFS.910.W.1.2; 2.4; LAFS.910.L.3.6	
23.03	Identify requirements involved in the design of structures.	LAFS.910.W.1.2; 2.4; LAFS.910.L.3.6	

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	23.04 Recommend maintenance, alterations, or renovations to improve a structure or alter its intended use.	LAFS.910.W.1.2; 2.4; LAFS.910.L.3.6; LAFS.910.SL.1.1, 2; 2.4	
	23.05 Identify prefabricated materials used in some structures.	LAFS.910.W.1.2; 2.4; LAFS.910.L.3.6	
24.0	Demonstrate safe and appropriate use of tools and machines in engineering technology. – The student will be able to:		
	24.01 Select appropriate tools, procedures, and/or equipment.		SC.912.N.1.1
	24.02 Demonstrate the safe usage of appropriate tools, procedures, and operation of equipment.		SC.912.N.1.1
	24.03 Follow laboratory safety rules and procedures.		SC.912.N.1.1
	24.04 Demonstrate good housekeeping at workstation within total laboratory.		SC.912.N.1.1
	24.05 Identify color-coding safety standards.	LAFS.910.W.1.2; 2.4; LAFS.910.L.3.6	SC.912.N.1.1
	24.06 Explain fire prevention and safety precautions and practices for extinguishing fires.	LAFS.910.W.1.2; 2.4; LAFS.910.L.3.6; LAFS.910.SL.1.1, 2; 2.6	SC.912.N.1.1
	24.07 Identify harmful effects/potential dangers of familiar hazardous substances/devices to people and the environment.	LAFS.910.W.1.2; 2.4; LAFS.910.L.3.6	SC.912.N.1.1
25.0	Demonstrate the ability to properly identify, organize, plan, and allocate resources. – The student will be able to:		
	25.01 Demonstrate the ability to select goal-relevant activities, rank them, allocate time, and prepare and follow schedules.	LAFS.910.W.1.2; 2.4; LAFS.910.L.3.6; LAFS.910.SL.1.2; 2.4, 5, 6	SC.912.N.1.1
	25.02 Use or prepare budgets, make forecasts, keep records, and make adjustments to meet objectives.	LAFS.910.W.1.2; 2.4; 4.10; LAFS.910.L.3.6	SC.912.N.1.1
	25.03 Demonstrate the ability to acquire, store, allocate, and use materials or space efficiently.		SC.912.N.1.1
	25.04 Display knowledge of the efficient use of human resources.	LAFS.910.W.2.6; 4.10; LAFS.910.SL.2.4, 5, 6; LAFS.910.L.3.6	SC.912.N.1.1
26.0	Demonstrate the functional characteristics of the engineering design team. – The student will be able to:		
	26.01 Describe work breakdown organization.	LAFS.910.W.1.2; 2.4; LAFS.910.SL.1.2; 2.4, 5, 6; LAFS.910.L.3.6; LAFS.910.RI.1.1	

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
26.02 Describe work group organization schemes including functional and hierarchical schemes.	LAFS.910.W.1.2; 2.4; LAFS.910.SL.1.2; 2.4, 5, 6; LAFS.910.L.3.6; LAFS.910.RI.1.1	
26.03 Describe the function of management in general and project management in particular.	LAFS.910.W.1.2; 2.4; LAFS.910.SL.1.2; 2.4, 5, 6; LAFS.910.L.3.6; LAFS.910.RI.1.1, 2	
26.04 Describe a typical design project team structure.	LAFS.910.W.1.2; 2.4; LAFS.910.SL.1.2; 2.4, 5, 6; LAFS.910.L.3.6; LAFS.910.RI.1.1	
26.05 Outline a research methodology.	LAFS.910.W.1.2; 2.4; LAFS.910.L.3.6	
26.06 Demonstrate brainstorming techniques.	LAFS.910.W.1.2; 2.4; 4.10; LAFS.910.L.3.6; LAFS.910.SL.2.6	
27.0 Demonstrate technical knowledge and skills in the processes and systems related to engineering. – The student will be able to:		
27.01 Assemble, operate, and identify the parts of a fluid system.	LAFS.910.W.1.2; 2.4; 4.10; LAFS.910.L.3.6; LAFS.910.SL.2.6	
27.02 Demonstrate and apply principles of force, work, rate, resistance, energy, power, and force transformers relating to fluid systems.	LAFS.910.W.1.2; 2.4; 4.10; LAFS.910.L.3.6; LAFS.910.SL.2.6 MAFS.912.G-GMD.1.3, MAFS.912.A-SSE.1.1, 2; MAFS.912.A-CED.1.3, 4	SC.912.P.10.3; SC.912.N.1.1
27.03 Assemble, operate, and identify the parts of a thermal system.	LAFS.910.W.1.2; 2.4; 4.10; LAFS.910.L.3.6; LAFS.910.SL.2.6	SC.912.P10.4, 7
27.04 Demonstrate and apply principles of force, work, rate, resistance, energy, power, and force transformers relating to thermal systems.	LAFS.910.W.1.2; 2.4; 4.10; LAFS.910.L.3.6; LAFS.910.SL.2.6 MAFS.912.A-SSE.1.1, 2; MAFS.912.A-CED.1.3, 4	SC.912.P.10.4; SC.912.N.1.1
27.05 Assemble, operate, and identify the parts of an electrical system.	LAFS.910.W.1.2; 2.4; 4.10; LAFS.910.L.3.6; LAFS.910.SL.2.6	SC.912.P.10.15

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	27.06 Demonstrate and apply principles of force, work, rate, resistance, energy, power, and force transformers relating to electrical systems.	LAFS.910.W.1.2; 2.4; 4.10; LAFS.910.L.3.6; LAFS.910.SL.2.6 MAFS.912.A-SSE.1.1, 2; MAFS.912.A-CED.1.3, 4	SC.912.P.10.3, 15
	27.07 Assemble, operate, and identify the parts of a mechanical system.	LAFS.910.W.1.2; 2.4; 4.10; LAFS.910.L.3.6; LAFS.910.SL.2.6	
	27.08 Demonstrate and apply principles of force, work, rate, resistance, energy, power, and force transformers relating to mechanical systems.	LAFS.910.W.1.2; 2.4; 4.10; LAFS.910.L.3.6; LAFS.910.SL.2.6 MAFS.912.A-SSE.1.1, 2; MAFS.912.A-CED.1.3, 4	SC.912.N.1.1
28.0	Demonstrate technical knowledge and skills in the designing, engineering, and analysis of constructed works. – The student will be able to:		
	28.01 Define terminology associated with engineering products and systems.	LAFS.910.L.3.6; LAFS.910.RI.2.4	SC.912.N.1.1
	28.02 Define and describe the experimental method as it is applied to design.	LAFS.910.L.3.6; LAFS.910.RI.2.4	SC.912.N.1.1
	28.03 Describe simulation.	LAFS.910.SL.1.1; LAFS.910.L.3.6	SC.912.N.1.1
	28.04 Prepare a model of a design solution to an engineering problem.		SC.912.N.1.1
	28.05 Prepare a graphical solution to an engineering problem.		SC.912.N.1.1
	28.06 Prepare a mathematical solution to an engineering problem (using either a calculator or computer).		SC.912.N.1.1
	28.07 Present a technical report on an engineering design problem, concept or issue.	LAFS.910.W.3.7, 8, 9; LAFS.910.RI.1.1, 2, 3; 4.10; LAFS.910.L.3.6	SC.912.N.1.1
29.0	Perform advanced study and technical skills related to engineering technology. – The student will be able to:		
	29.01 Identify an engineering problem or product for improvement using the design methodology.	LAFS.910.RI.2.4; 3.7; LAFS.910.L.3.6	SC.912.N.1.1
	29.02 Develop a written plan of work for the engineering team to carry out the project.	LAFS.910.W.1.2; 2.4; 4.10; LAFS.910.L.3.6	SC.912.N.1.1
	29.03 Show evidence of technical study in support of the project.	LAFS.910.RI.2.4; 3.7; LAFS.910.L.3.6	SC.912.N.1.1
	29.04 Perform skills related to the engineering project.		SC.912.N.1.1

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
29.05 Complete the project as planned.		SC.912.N.1.1
29.06 Demonstrate the engineering design solution to a fluid system problem.		SC.912.N.1.1
29.07 Demonstrate the engineering design solution to an electrical system problem.		SC.912.N.1.1
29.08 Demonstrate the engineering design solution to a thermal system problem.		SC.912.N.1.1
29.09 Demonstrate the engineering design solution to a mechanical system problem.		SC.912.N.1.1
29.10 Formulate conclusions based on the analysis of engineered products.	LAFS.910.RI.1.1, 2; LAFS.910.W.1.2; 2.4; LAFS.910.L.3.6	SC.912.N.1.1

Florida Department of Education
Student Performance Standards

Course Title: **Engineering Technology III**
Course Number: **8601770**
Course Credit: **1**

Course Description:
This program provides students with an advanced understanding of the knowledge, human relations, and technological skills found today in technical profession.

Florida Standards			Correlation to CTE Program Standard #
30.0	Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Engineering Technology.		
	30.01 Key Ideas and Details		
	30.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. LAFS.1112.RST.1.1	
	30.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.1112.RST.1.2	
	30.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.1112.RST.1.3	
	30.02 Craft and Structure		
	30.02.1	Determine the meaning of symbols key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. LAFS.1112.RST.2.4	
	30.02.2	Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. LAFS.1112.RST.2.5	
	30.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. LAFS.1112.RST.2.6	

Florida Standards			Correlation to CTE Program Standard #
30.03	Integration of Knowledge and Ideas		
	30.03.1	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g. quantitative data, video, multimedia) in order to address a question or solve a problem. LAFS.1112.RST.3.7	
	30.03.2	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. LAFS.1112.RST.3.8	
	30.03.3	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. LAFS.1112.RST.3.9	
30.04	Range of Reading and Level of Text Complexity		
	30.04.1	By the end of grade 11, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	30.04.2	By the end of grade 12, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 11–CCR text complexity band independently and proficiently. LAFS.1112.RST.4.10	
31.0	Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Engineering Technology.		
31.01	Text Types and Purposes		
	31.01.1	Write arguments focused on discipline-specific content. LAFS.1112.WHST.1.1	
	31.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.1112.WHST.1.2	
31.02	Production and Distribution of Writing		
	31.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.1112.WHST.2.4	

Florida Standards			Correlation to CTE Program Standard #
	31.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.1112.WHST.2.5	
	31.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. LAFS.1112.WHST.2.6	
	31.03	Research to Build and Present Knowledge	
	31.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.1112.WHST.3.7	
	31.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. LAFS.1112.WHST.3.8	
	31.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.1112.WHST.3.9	
	31.04	Range of Writing	
	31.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.1112.WHST.4.10	
32.0	Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Engineering Technology.		
	32.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	
	32.02	Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
	32.03	Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	

Florida Standards	Correlation to CTE Program Standard #
32.04 Model with mathematics. MAFS.K12.MP.4.1	
32.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
32.06 Attend to precision. MAFS.K12.MP.6.1	
32.07 Look for and make use of structure. MAFS.K12.MP.7.1	
32.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
04.0 Demonstrate an understanding of the characteristics and scope of technology. – The student will be able to:		
04.01 Conduct specific goal-directed research related to inventions and innovations.	LAFS.1112.W.3.7, 8, 9; LAFS.1112.RI.1.1, 3; 2.4; LAFS.1112.L.3.6	SC.912.N.1.1
04.02 Evaluate current technological developments that are/were driven by profit motive and the market.	LAFS.1112.L.3.6, LAFS.1112.RI.2.4; 3.8	
05.0 Demonstrate an understanding of the core concepts of technology. – The student will be able to:		
05.01 Apply systems thinking logic and creativity with appropriate compromises in complex real-life problems.		SC.912.N.1.7
05.02 Assess technological systems, which are the building blocks of technology and are embedded within larger technological, social, and environmental systems.	LAFS.1112.L.3.6, LAFS.1112.RI.1.3; 2.4; 3.8	
05.03 Assess the stability of a technological system and its influence by all of the components in the system, especially those in the feedback loop.	LAFS.1112.L.3.6, LAFS.1112.RI.1.3; 2.4; 3.8	SC.912.N.1.4
05.04 Compare resources involving trade-offs between competing values, such as availability, cost, desirability, and waste.	LAFS.1112.RI.1.2; 2.4; LAFS.1112.L.3.6; LAFS.1112.W.4.10; LAFS.1112.SL.2.6	SC.912.N.1.4
05.05 Identify the criteria and constraints of a product or system and determine how they affect the final design and development.	LAFS.1112.RI.1.2; 2.4; LAFS.1112.L.3.6	SC.912.N.1.4

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
05.06	Propose strategies for optimizing a technological process or methodology of designing or making a product, dependent on criteria and constraints.	LAFS.1112.W.1.2; LAFS.1112.RI.1.1, 2; LAFS.1112.L.3.6	SC.912.N.1.1
05.07	Discuss new technologies that create new processes.	LAFS.1112.SL.1.1, 2; 2.6; LAFS.1112.L.3.6; LAFS.1112.RI.4.10	SC.912.N.2.4
05.08	Recommend a quality control process to ensure that a product, service or system meets established criteria.	LAFS.1112.W.1.2; 2.4; LAFS.1112.L.3.6; LAFS.1112.SL.1.1, 2; 2.4	SC.912.N.1.1
05.09	Organize a management system as the process of planning, organizing, and controlling work.	LAFS.1112.W.1.2; 2.4; LAFS.1112.SL.2.6; LAFS.1112.L.3.6	SC.912.N.1.1
05.10	Outline complex systems that have many layers of controls and feedback loops to provide information.	LAFS.1112.W.1.2; 2.4; LAFS.1112.L.3.6	SC.912.N.1.1
06.0	Demonstrate an understanding of the relationships among technologies and the connection between technology and other fields of study. – The student will be able to:		
06.01	Examine technology transfer occurring when a new user applies an existing innovation developed for one purpose in a different function.	LAFS.1112.RI.1.1, 3; 4.10; LAFS.1112.L.3.6	SC.912.N.2.5
06.02	Examine technological innovation resulting when ideas, knowledge, or skills are shared within a technology, among technologies, or across other fields.	LAFS.1112.RI.1.1, 3; 4.10; LAFS.1112.L.3.6	SC.912.N.2.5
06.03	Investigate technological progresses that promote the advancement of science and mathematics.	LAFS.1112.W.3.7, 8, 9; LAFS.1112.RI.1.1, 2, 3; 4.10; LAFS.1112.L.3.6	SC.912.N.2.4
07.0	Demonstrate an understanding of the cultural, social, economic, and political effects of technology. – The student will be able to:		
07.01	Discuss changes caused by the use of technology ranging from gradual to rapid and from subtle to obvious.	LAFS.1112.SL.1.1, 2; 2.6; LAFS.1112.L.3.6	SC.912.N.4.2
07.02	Evaluate the use of technology involving weighing the trade-offs between the positive and the negative effects.	LAFS.1112.L.3.6, LAFS.1112.RI.1.3; 3.7	SC.912.N.4.2
07.03	Discuss ethical considerations important in the development, selection, and use of technologies.	LAFS.1112.RI.1.1, 3; 4.10; LAFS.1112.L.3.6	SC.912.N.4.2
07.04	Debate the cultural, social, economic, and political changes caused by the transfer of a technology from one society to another.	LAFS.1112.W.1.1; 2.4; LAFS.1112.SL.2.4, 6; LAFS.1112.L.3.6	SC.912.N.4.2
08.0	Demonstrate an understanding of the effects of technology on the environment. – The student will be able to:		
08.01	Consider trade-offs of developing technologies to reduce the use of resources.	LAFS.1112.RI.1.3; 2.4; 3.8; LAFS.1112.L.3.6	SC.912.L.17.11, 15

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	08.02 Compare and contrast the alignment of technological processes with natural processes to maximize performance and reduce negative impacts on the environment.	LAFS.1112.RI.1.3; 2.4; 3.8; LAFS.1112.L.3.6	SC.912.L.17.17
	08.03 Assess technologies devised to reduce the negative consequences of other technologies.	LAFS.1112.RI.1.3; 2.4; 3.8; LAFS.1112.L.3.6	SC.912.L.17.17
	08.04 Make decisions about the implementation of technologies involving the weighing of trade-offs between predicted positive and negative effects on the environment.	LAFS.1112.RI.1.3; 2.4; 3.8; LAFS.1112.L.3.6	SC.912.L.17.13, 17
09.0	Demonstrate an understanding of the role of society in the development and use of technology. – The student will be able to:		
	09.01 Consider societal opinions and demands, as well as corporate cultures to use as a basis for deciding whether or not to develop a technology.	LAFS.1112.RI.1.3; 2.4; 3.8; LAFS.1112.L.3.6	SC.912.N.1.1
	09.02 Evaluate a number of different factors, such as advertising, the strength of the economy, the goals of a company, and the latest fads as contributors to shaping the design of and demand for various technologies.	LAFS.1112.RI.1.3; 2.4; 3.8; LAFS.1112.L.3.6	SC.912.N.1.1
10.0	Demonstrate an understanding of the influence of technology on history. – The student will be able to:		
	10.01 Assess how the evolution of civilization has been directly affected by, and has in turn affected, the development and use of tools and materials.	LAFS.1112.RI.1.3; 2.4; 3.8; LAFS.1112.L.3.6	
	10.02 Discuss the history of technology as a powerful force in reshaping the social, cultural, political, and economic landscape.	LAFS.1112.SL.1.1, 2; 2.6; LAFS.1112.L.3.6	
	10.03 Describe the Iron Age as the use of iron and steel as the primary materials for tools.	LAFS.1112.RI.2.4; 3.7; LAFS.1112.W.4.10, LAFS.1112.L.3.6	
	10.04 Discuss the Industrial Revolution and the development of continuous manufacturing, sophisticated transportation and communication systems, advanced construction practices, and improved education and leisure time.	LAFS.1112.SL.1.1, 2; 2.6; LAFS.1112.L.3.6	
	10.05 Describe the Information Age and its placement of emphasis on the processing and exchange of information.	LAFS.1112.RI.2.4; 3.7; LAFS.1112.W.4.10, LAFS.1112.L.3.6	
11.0	Demonstrate an understanding of the attributes of design. – The student will be able to:		
	11.01 Apply the design process; including defining a problem, brainstorming, researching and generating ideas, identifying criteria and specifying constraints, exploring possibilities, selecting an approach, developing a design proposal, making a model or prototype, testing and evaluating the design using specifications, refining the design, creating or making it, and communicating processes and results.		SC.912.N.1.1

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
11.02	Translate design problems that are seldom presented in a clearly defined form.	LAFS.1112.RI4.10, LAFS.1112.W1.2; 2.4; LAFS.1112.SL.1.1, 2; 2.6; 3.6	SC.912.N.1.1
11.03	Evaluate a design continually, and improve and revise the idea of the design as needed.	LAFS.1112.RI.1.3; 3.7; 4.10; LAFS.1112.W.1.2; 2.5; LAFS.1112.L.3.6	SC.912.N.1.1
11.04	Analyze competing requirements of a design, such as criteria, constraints, and efficiency.	LAFS.1112.RI.1.3; 2.4; 4.10; LAFS.1112.L.3.6	SC.912.N.1.1
12.0	Demonstrate an understanding of engineering design. – The student will be able to:		
12.01	Select design principles used to evaluate existing designs, to collect data, and to guide the design process.	LAFS.1112.RI.2.4; 3.7; LAFS.1112.W.3.8, LAFS.1112.L.3.6	SC.912.N.1.1
12.02	Examine the influence of personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly on the Engineering Design process.	LAFS.1112.RI.1.2, 3; 2.4; 4.10; LAFS.1112.L.3.6	SC.912.N.1.1
12.03	Construct a prototype or a working model used to test a design concept by making actual observations and necessary adjustments.		SC.912.N.1.1
12.04	Evaluate factors taken into account in the process of engineering.	LAFS.1112.RI.3.7; LAFS.1112.L.3.6	SC.912.N.1.1
13.0	Demonstrate an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving. – The student will be able to:		
13.01	Employ research and development as a specific problem solving approach that is used intensively in business and industry to prepare devices and systems for the marketplace.	LAFS.1112.RI.4.10; LAFS.1112.L.3.6	SC.912.N.1.1
13.02	Conduct research needed to solve technological problems.	LAFS.1112.W.1.2; 3.7, 8, 9; LAFS.1112.L.3.6	SC.912.N.1.1
13.03	Differentiate between technological and non-technological problems, and identify which problems can be solved using technology.	LAFS.1112.RI.2.4, 3.8; LAFS.1112.L.3.6	SC.912.N.1.1
13.04	Utilize a multidisciplinary approach to solving technological problems.	LAFS.1112.W.2.6; 3.7, 8, 9; LAFS.1112.L.3.6	SC.912.N.1.1
14.0	Demonstrate the abilities to apply the design process. – The student will be able to:		
14.01	Interpret the design problem to solve and decide whether or not to address it.	LAFS.1112.RI.2.4; 3.7 LAFS.1112.L.3.6	SC.912.N.1.1
14.02	Evaluate criteria and constraints and determine how these will affect the design process.	LAFS.1112.RI.2.4; 3.7 LAFS.1112.L.3.6	SC.912.N.1.1
14.03	Refine a design by using prototypes and modeling to ensure quality, efficiency, and productivity of the final product.		SC.912.N.1.1

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
14.04	Evaluate the design solution using conceptual, physical, and mathematical models at various intervals of the design process in order to check for proper design and to note areas where improvements are needed.	LAFS.1112.L.3.6, LAFS.1112.W.1.2; 2.4; LAFS.1112.RI.4.10	SC.912.N.1.1
14.05	Produce a product or system using a design process.		SC.912.N.1.1
14.06	Evaluate final solutions and communicate observations, processes, and results of the entire design process, using verbal, graphic, quantitative, virtual, and written means, in addition to three-dimensional models.	LAFS.1112.SL.2.4, 5, 6; LAFS.1112.W.2.4, 6; LAFS.1112.L.3.6; LAFS.1112.RI.4.10	SC.912.N.1.1
15.0	Demonstrate the abilities to use and maintain technological products and systems. – The student will be able to:		
15.01	Document processes and procedures and communicate them to different audiences using appropriate oral and written techniques.	LAFS.1112.SL.2.4, 5, 6; LAFS.1112.W.2.4, 6; LAFS.1112.L.3.6	SC.912.N.1.1
15.02	Diagnose a system that is malfunctioning and use tools, materials, machines, and knowledge to repair it.		SC.912.N.1.1
15.03	Troubleshoot, analyze, and maintain systems to ensure safe and proper function and precision.		SC.912.N.1.1
15.04	Operate systems so that they function in the way they were designed.		SC.912.N.1.1
15.05	Use computers and calculators to access, retrieve, organize, process, maintain, interpret, and evaluate data and information in order to communicate.	LAFS.1112.W.2.6; LAFS.1112.SL.2.4, 5, 6; LAFS.1112.RI.4.10; LAFS.1112.L.3.6	SC.912.N.1.1
16.0	Demonstrate the abilities to assess the impact of products and systems. – The student will be able to:		
16.01	Collect information and evaluate its quality.	LAFS.1112.W.3.8; LAFS.1112.L.3.6; LAFS.1112.RI.4.10	SC.912.N.1.1
16.02	Synthesize data, analyze trends, and draw conclusions regarding the effect of technology on the individual, society, and the environment.	LAFS.1112.RI.1.1, 3; 2.4; 3.8; LAFS.1112.L.3.6 MAFS.912.N-Q.1.1, 2, 3; MAFS.912.A-SSE.1.1, 2	SC.912.N.1.1
16.03	Apply assessment techniques, such as trend analysis and experimentation to make decisions about the future development of technology.	LAFS.1112.RI.1.1, 2, 3; 2.4; 4.10; LAFS.1112.L.3.6	SC.912.N.1.1
16.04	Design forecasting techniques to evaluate the results of altering natural systems.	LAFS.1112.W.1.2; 2.4, 5; 4.10; LAFS.1112.L.3.6	SC.912.N.1.1

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
19.0	Demonstrate an understanding of and be able to select and use energy and power technologies. – The student will be able to:		
19.01	Discuss how energy cannot be created nor destroyed; however, it can be converted from one form to another.	LAFS.1112.SL.1.1, 2; 2.6; LAFS.1112.L.3.6	SC.912.P.10.1
19.02	Categorize types of energy into major forms: thermal, radiant, electrical, mechanical, chemical, nuclear, and others.	LAFS.1112.W.1.2; LAFS.1112.L.3.6	SC.912.P.10.1
19.03	Classify energy resources as renewable or nonrenewable.	LAFS.1112.W.1.2; LAFS.1112.L.3.6	SC.912.L.17.11
19.04	Construct a power system having a source of energy, a process, and loads.		SC.912.N.1.1
20.0	Demonstrate an understanding of and be able to select and use information and communication technologies. – The student will be able to:		
20.01	Discuss information and communication technologies including the inputs, processes, and outputs associated with sending and receiving information.	LAFS.1112.SL.1.1, 2; 2.6; LAFS.1112.L.3.6	SC.912.N.1.1
20.02	Classify information and communication systems that allow information to be transferred as human to human, human to machine, machine to human, or machine to machine.	LAFS.1112.W.1.2; LAFS.1112.L.3.6; LAFS.1112.RI.4.10	SC.912.N.1.1
20.03	Use information and communication systems to inform, persuade, entertain, control, manage, and educate.	LAFS.1112.L.3.6; LAFS.1112.SL.1.1,2; 2.4,5,6 LAFS.1112.RI.4.10	SC.912.N.1.1
20.04	Identify components of a communications system, including source, encoder, transmitter, receiver, decoder, storage, retrieval, and destination.	LAFS.1112.L.3.6; LAFS.1112.W.1.2	SC.912.N.1.1
20.05	Identify many ways to communicate information, such as graphic and electronic means.	LAFS.1112.L.3.6; LAFS.1112.SL.2.4, 5	SC.912.N.1.1
20.06	Communicate technological knowledge and processes using symbols, measurement, conventions, icons, graphic images, and languages that incorporate a variety of visual, auditory, and tactile stimuli.	LAFS.1112.L.3.6; LAFS.1112.SL.2.5, 6	SC.912.N.1.1
21.0	Demonstrate an understanding of and be able to select and use transportation technologies. – The student will be able to:		
21.01	Analyze the vital role played by transportation in the operation of other technologies, such as manufacturing, construction, communication, health and safety, and agriculture.	LAFS.1112.RI.1.1, 3; LAFS.1112.W.2.4; 4.10; LAFS.1112.SL.2.4, 5, 6; LAFS.1112.L.3.6	
21.02	Define intermodalism as the use of different modes of transportation, such as highways, railways, and waterways as part of an interconnected system that can move people and goods easily from one mode to another.	LAFS.1112.L.3.6; LAFS.1112.W.4.10; LAFS.1112.RI.2.4	

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	21.03 Discuss how transportation services and methods have led to a population that is regularly on the move.	LAFS.1112.SL.1.1, 2; LAFS.1112.RI.1.1; LAFS.1112.L.3.6	
	21.04 Identify processes and innovative techniques involved in the design of intelligent and non-intelligent transportation systems.	LAFS.1112.RI.1.1, 3; LAFS.1112.L.3.6	
22.0	Demonstrate an understanding of and be able to select and use manufacturing technologies. – The student will be able to:		
	22.01 Service products to keep them in good operating condition.		SC.912.N.1.1
	22.02 Classify materials based on their qualities as natural, synthetic, or mixed.	LAFS.1112.W.1.2; 2.4; LAFS.1112.L.3.6; LAFS.1112.RI.4.10	SC.912.P.8.1
	22.03 Classify goods as durable goods designed to operate for a long period of time, or non-durable goods designed to operate for a short period of time.	LAFS.1112.W.1.2; 2.4; LAFS.1112.L.3.6; LAFS.1112.RI.4.10	
	22.04 Identify and classify manufacturing systems into types, such as customized production, batch production, and continuous production.	LAFS.1112.W.1.2; 2.4; LAFS.1112.L.3.6; LAFS.1112.RI.4.10	
	22.05 Discuss the interchangeability of parts to increase the effectiveness of manufacturing processes.	LAFS.1112.SL.1.1; 2.6; LAFS.1112.L.3.6	
	22.06 Employ marketing techniques involving establishing a product's identity, conducting research on its potential, advertising it, distributing it, and selling it.	LAFS.1112.W.4.10	
23.0	Demonstrate an understanding of and be able to select and use construction technologies. – The student will be able to:		
	23.01 Define infrastructure as the underlying base or basic framework of a system.	LAFS.1112.L.3.6; LAFS.1112.W.4.10; LAFS.1112.RI.2.4	
	23.02 Identify a variety of processes and procedures used in constructing structures.	LAFS.1112.W.1.2; 2.4; LAFS.1112.L.3.6; LAFS.1112.RI.4.10	
	23.03 Identify requirements involved in the design of structures.	LAFS.1112.W.1.2; 2.4; LAFS.1112.L.3.6; LAFS.1112.RI.1.1	
	23.04 Recommend maintenance, alterations, or renovations to improve a structure or alter its intended use.	LAFS.1112.W.1.2; 2.4; LAFS.1112.L.3.6; LAFS.1112.SL.1.1, 2; 2.4	
	23.05 Identify prefabricated materials used in some structures.	LAFS.1112.W.1.2; 2.4; LAFS.1112.L.3.6; LAFS.1112.RI.1.1	
24.0	Demonstrate safe and appropriate use of tools and machines in engineering technology. – The student will be able to:		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
24.01	Select appropriate tools, procedures, and/or equipment.		SC.912.N.1.1
24.02	Demonstrate the safe usage of appropriate tools, procedures, and operation of equipment.		SC.912.N.1.1
24.03	Follow laboratory safety rules and procedures.		SC.912.N.1.1
24.04	Demonstrate good housekeeping at workstation within total laboratory.		SC.912.N.1.1
24.05	Identify color-coding safety standards.	LAFS.1112.W.1.2; 2.4; LAFS.1112.L.3.6; LAFS.1112.RI.1.1	SC.912.N.1.1
24.06	Explain fire prevention and safety precautions and practices for extinguishing fires.	LAFS.1112.W.1.2; 2.4; LAFS.1112.L.3.6; LAFS.1112.SL.1.1; 2.6; LAFS.1112.RI.4.10	SC.912.N.1.1
24.07	Identify harmful effects/potential dangers of familiar hazardous substances/devices to people and the environment.	LAFS.1112.W.1.2; 2.4; LAFS.1112.L.3.6; LAFS.1112.RI.4.10	SC.912.N.1.1
25.0	Demonstrate the ability to properly identify, organize, plan, and allocate resources. – The student will be able to:		
25.01	Demonstrate the ability to select goal-relevant activities, rank them, allocate time, and prepare and follow schedules.	LAFS.1112.W.1.2; 2.4; LAFS.1112.SL.1.2; 2.4, 5, 6; LAFS.1112.L.3.6	SC.912.N.1.1
25.02	Use or prepare budgets, make forecasts, keep records, and make adjustments to meet objectives.	LAFS.1112.W.1.2; 4.10; LAFS.1112.L.3.6	SC.912.N.1.1
25.03	Demonstrate the ability to acquire, store, allocate, and use materials or space efficiently.		SC.912.N.1.1
25.04	Display knowledge of the efficient use of human resources.	LAFS.1112.W.2.6: 4.10; LAFS.1112.SL.2.4; 5, 6; LAFS.1112.L.3.6	SC.912.N.1.1
26.0	Demonstrate the functional characteristics of the engineering design team. – The student will be able to:		
26.01	Describe work breakdown organization.	LAFS.1112.W.1.2; 2.4; LAFS.1112.SL.1.2; 2.4, 5, 6; LAFS.1112.RI.1.1	
26.02	Describe work group organization schemes including functional and hierarchical schemes.	LAFS.1112.W.1.2; 2.4; LAFS.1112.SL.1.2; 2.4, 5, 6; LAFS.1112.RI.1.1	
26.03	Describe the function of management in general and project management in particular.	LAFS.1112.W.1.2; 2.4; LAFS.1112.SL.1.2; 2.4, 5, 6; LAFS.1112.RI.1.1, 2	

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
26.04 Describe a typical design project team structure.	LAFS.1112.W.1.2; 2.4; LAFS.1112.SL.1.2; 2.4, 5, 6; LAFS.1112.RI.1.1, 2	
26.05 Outline a research methodology.	LAFS.1112.W.1.2; 2.4; LAFS.1112.L.3.6	
26.06 Demonstrate brainstorming techniques.	LAFS.1112.W.1.2; 2.4; 4.10; LAFS.1112.L.3.6; LAFS.1112.SL.2.6	
27.0 Demonstrate technical knowledge and skills in the processes and systems related to engineering. – The student will be able to:		
27.01 Assemble, operate, and identify the parts of a fluid system.	LAFS.1112.W.1.2; 2.4; 4.10; LAFS.1112.L.3.6; LAFS.1112.RI.4.10	
27.02 Demonstrate and apply principles of force, work, rate, resistance, energy, power, and force transformers relating to fluid systems.	LAFS.1112.W.1.2; 2.4; 4.10; LAFS.1112.L.3.6; LAFS.1112.RI.4.10 MAFS.912.G-GMD.1.3; MAFS.912.A-SSE.1.1, 2; MAFS.912.A-CED.1.3, 4	SC.912.N.1.1; SC.912.P.10.3
27.03 Assemble, operate, and identify the parts of a thermal system.	LAFS.1112.W.1.2; 2.4; 4.10; LAFS.1112.L.3.6; LAFS.1112.RI.4.10	SC.912.P.10.4, 7
27.04 Demonstrate and apply principles of force, work, rate, resistance, energy, power, and force transformers relating to thermal systems.	LAFS.1112.W.1.2; 2.4; 4.10; LAFS.1112.L.3.6; LAFS.1112.RI.4.10 MAFS.912.A-SSE.1.1, 2; MAFS.912.A-CED.1.3, 4	SC.912.N.1.1; SC.912.P.10.4
27.05 Assemble, operate, and identify the parts of an electrical system.	LAFS.1112.W.1.2; 2.4; 4.10; LAFS.1112.L.3.6; LAFS.1112.RI.4.10	SC.912.P.10.15
27.06 Demonstrate and apply principles of force, work, rate, resistance, energy, power, and force transformers relating to electrical systems.	LAFS.1112.W.1.2; 2.4; 4.10; LAFS.1112.L.3.6; LAFS.1112.RI.4.10 MAFS.912.A-SSE.1.1, 2; MAFS.912.A-CED.1.3, 4	SC.912.P.10.3, 15
27.07 Assemble, operate, and identify the parts of a mechanical system.	LAFS.1112.W.1.2; 2.4; 4.10; LAFS.1112.L.3.6; LAFS.1112.RI.4.10	

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	27.08 Demonstrate and apply principles of force, work, rate, resistance, energy, power, and force transformers relating to mechanical systems.	LAFS.1112.W.1.2; 2.4; 4.10; LAFS.1112.L.3.6; LAFS.1112.RI.4.10 MAFS.912.A-SSE.1.1, 2; MAFS.912.A-CED.1.3, 4	SC.912.N.1.1
28.0	Demonstrate technical knowledge and skills in the designing, engineering, and analysis of constructed works. – The student will be able to:		
	28.01 Define terminology associated with engineering products, processes, and systems.	LAFS.1112.L.3.6; LAFS.1112.RI.2.4	SC.912.N.1.1
	28.02 Define and describe the experimental method as it is applied to design.	LAFS.1112.L.3.6; LAFS.1112.RI.2.4	SC.912.N.1.1
	28.03 Describe simulation.	LAFS.1112.SL.1.1; LAFS.1112.L.3.6	SC.912.N.1.1
	28.04 Prepare a model of a design solution to an engineering problem.		SC.912.N.1.1
	28.05 Prepare a graphical solution to an engineering problem.		SC.912.N.1.1
	28.06 Prepare a mathematical solution to an engineering problem (using either a calculator or computer).	LAFS.1112.W.3.7, 8, 9; LAFS.1112.RI.1.1, 2, 3; 4.10; LAFS.1112.L.3.6	SC.912.N.1.1
	28.07 Present a technical report on an engineering design problem, concept or issue.	LAFS.1112.SL.1.2; 2.4, 5, 6	SC.912.N.1.1
29.0	Perform advanced study and technical skills related to engineering technology. – The student will be able to:		
	29.01 Identify an engineering problem or product for improvement using engineering design methodology.	LAFS.1112.RI.2.4; 3.7; 4.10; LAFS.1112.L.3.6	SC.912.N.1.1
	29.02 Develop a written plan of work for the engineering team to carry out the project.	LAFS.1112.W.1.2; 2.4; 4.10; LAFS.1112.L.3.6	SC.912.N.1.1
	29.03 Show evidence of technical research in support of the project.	LAFS.1112.RI.1.1; LAFS.1112.W.4.10; LAFS.1112.L.3.6	SC.912.N.1.1
	29.04 Perform skills related to the engineering project.		SC.912.N.1.1
	29.05 Complete the project as planned.		SC.912.N.1.1
	29.06 Demonstrate the engineering design solution to a fluid system problem.		SC.912.N.1.1
	29.07 Demonstrate the engineering design solution to an electrical system problem.		SC.912.N.1.1
	29.08 Demonstrate the engineering design solution to a thermal system problem.		SC.912.N.1.1

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
29.09	Demonstrate and present the engineering design solution to a mechanical system problem.		SC.912.N.1.1
29.10	Formulate conclusions based on the analysis of engineered products.	LAFS.1112.RI.1.1, 2; LAFS.1112.W.1.2; 2.4; LAFS.1112.L.3.6	SC.912.N.1.1
33.0	Demonstrate an understanding of career opportunities and requirements in the field of engineering technology. – The student will be able to:		
33.01	Discuss individual interests related to a career in engineering technology.	LAFS.1112.SL.1.1, 2; 2.6; LAFS.1112.L.3.6	
33.02	Explore career opportunities related to engineering technology.	LAFS.1112.W.1.2; 2.4; 3.7, 8, 9; 4.10; LAFS.1112.L.3.6	
33.03	Explore secondary education opportunities related to engineering technology.	LAFS.1112.W.1.2; 2.4; 3.7, 8, 9; 4.10; LAFS.1112.L.3.6	
33.04	Conduct a job search.	LAFS.1112.W.1.2; 2.4; 3.7, 8, 9; 4.10; LAFS.1112.L.3.6	
33.05	Complete a job application form correctly.	LAFS.1112.W.4.10; LAFS.1112.RI.4.10	
33.06	Demonstrate competence in job interview techniques.	LAFS.1112.SL.2.6; LAFS.1112.L.3.6	
33.07	Create a professional resume and letter of introduction.	LAFS.1112.W.1.3; 2.4, 5, 6; LAFS.1112.L.3.6	
33.08	Solicit awards, letters of recommendation and recognition.	LAFS.1112.W.3.8	
33.09	Organize work samples in a professional, presentable format.	LAFS.1112.W.2.6; 3.8	

Additional Information

Laboratory Activities

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

Career and Technical Student Organization (CTSO)

The Florida Technology Student Association (FL-TSA) is the intercurricular career and technical student organization for providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

Cooperative Training – OJT

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

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 Occupational Completion Point (OCP) or a Modified Occupational Completion Point (MOCP). If needed, a student may enroll in the same career and technical course more than once. Documentation should be included in the IEP that clearly indicates that it is anticipated that the student may need an additional year to complete an OCP/MOCP. The student should work on different competencies and new applications of competencies each year toward completion of the OCP/MOCP. After achieving the competencies identified for the year, the student earns credit for the course. It is important to ensure that credits earned by students are reported accurately. The district's information system must be designed to accept multiple credits for the same course number for eligible students with disabilities.

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

Florida Department of Education
Curriculum Framework

Program Title: **Scientific Visualization**
Program Type: **Non Career Preparatory**
Career Cluster: **Engineering & Technology Education**

Secondary – Non Career Preparatory	
Program Number	9400100
CIP Number	0507039918
Grade Level	9-12; 30, 31
Standard Length	5 credits
Teacher Certification	TEC ED 1 @2 COMPU SCI 6 ENG @7 7G SCI VIZ 7G
CTSO	Florida Technology Student Association (FL-TSA)
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This Engineering and Technology Education program focuses on the principles, concepts, and use of complex graphic and visualization tools as applied to the study of science and technology. Students use complex 2D graphics, 3D Animation, editing, and image analysis tools to better understand, illustrate, explain, and present technical, mathematical, and/or scientific concepts and principles. Emphasis is placed on the use of computer enhanced images to generate both conceptual and data-driven models, data-driven charts, and animations. Science, math, and visual design concepts are reinforced throughout each course.

The skills students acquire in this program can be applied to many different occupations, however, occupations that require scientific visualization skills do not typically include the term in the job title. For example, a person who designs educational web pages for a zoo or a museum is using scientific visualization to convey scientific ideas to the public. Also, a research chemist may use scientific visualization to design a better medical drug, or an engineer might use the same skills to design a faster race car. This course helps students gain experience using a multitude of computer graphic software, develop problem solving skills, become independent learners, and acquire the intellectual confidence necessary for success in their post-secondary educational pursuits.

The Scientific Visualization program is a sequence of four courses with provisions for an internship for students as a capstone experience. In addition to complex visualization tools, the content of this program includes the development of the following computer skills and concepts: computer application skills (e.g., word processing, spreadsheet, presentation, and desktop publishing), Internet browser applications, computer programming, advanced web tools, and basic concepts of relational databases and the tools to use them. Additionally, this program stresses

understanding of geospatial concepts, project management strategies, applications of geographic data elements and remotely sensed data, and visualizations of dynamic spatial data.

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 the courses shown in the following table:

Course Number	Course Title	Length	Level	Graduation Requirement
8207310	Introduction to Information Technology/Digital Information Technology	1 credit	2	PA
9400110	Principles of Scientific Visualization	1 credit	3	VO
9400120	Data Modeling	1 credit	3	PA
9400130	Advanced Applications in Scientific Visualization	1 credit	3	PA
9400140	SciViz Internship	1 credit	2	VO

(Graduation Requirement Abbreviations- EQ= Equally Rigorous Science, PA= Practical Arts, EC= Economics, VO= Career and Technical Education)

Academic Alignment

Academic alignment is an ongoing, collaborative effort of professional educators specializing in the fields of science, mathematics, English/language arts, and Career and Technical Education (CTE). This initiative supports CTE programs by improving student performance through the integration of academic content within CTE courses. Career and Technical Education courses that have been aligned to the Next Generation Sunshine State Standards for Science and the Florida Standards for Mathematics and English/Language Arts will show the following data: the quantity of academic standards in the CTE course; the total number of standards contained in the academic course; and the percentage of alignment to the CTE course.

Courses	Anatomy/ Physiology Honors	Astronomy Solar/Galactic Honors	Biology 1	Chemistry 1	Earth-Space Science	Environmental Science	Genetics	Integrated Science	Marine Science 1 Honors	Physical Science	Physics 1
8207310	15/87 17%	22/80 28%	14/83 17%	20/69 29%	12/67 18%	23/70 33%	15/69 22%	12/82 15%	23/66 35%	16/74 22%	18/72 25%
9400110	2/87 2%	9/80 11%	8/83 10%	3/69 4%	4/67 6%	5/70 7%	5/69 7%	9/82 11%	8/66 12%	4/74 5%	5/72 7%
9400120	2/87 2%	5/80 6%	3/83 4%	1/69 1%	6/67 9%	1/70 1%	4/69 6%	5/82 6%	2/66 3%	2/74 3%	2/72 3%
9400130	#	#	3/83 4%	#	1/67 1%	#	1/69 1%	3/82 4%	#	#	#
9400140	#	#	#	#	#	#	#	#	#	#	#

** *Alignment pending review* # *Alignment attempted, but no correlation to academic course*

Courses	Algebra 1	Algebra 2	Geometry	English 1	English 2	English 3	English 4
8207310	20/67 30%	15/75 20%	4/54 7%	40/46 87%	40/45 89%	40/45 89%	40/45 89%
9400110	**	**	**	**	**	**	**
9400120	**	**	**	**	**	**	**
9400130	**	**	**	**	**	**	**
9400140	**	**	**	**	**	**	**

** *Alignment pending review* # *Alignment attempted, but no correlation to academic course*

Florida Standards for Technical Subjects

Florida Standards (FS) for English Language Arts and Literacy in History/Social Studies, Science, and Technical Subjects are the critical reading and writing literacy standards designed for grade 6 and above. These standards are predicated on teachers of history/social studies, science, and technical subjects using their content area expertise to help students meet the particular challenges of reading, writing, speaking, listening, and language in their respective fields. It is important to note that the 6-12 literacy standards in history/social studies, science, and technical subjects are not meant to replace content standards in those areas but rather to supplement them.

This curriculum framework incorporates the grades 9-10 reading and writing literacy standards in the first two courses of this CTE program and grade 11-12 reading and writing literacy standards in the third and fourth courses of this CTE program. The standards for Mathematical Practices describe varieties of expertise that educators at all levels should seek to develop in their students. These practices rest on important "processes and proficiencies" with longstanding importance in mathematics education. This curriculum framework incorporates the appropriate mathematical practices in the first four courses of this CTE program.

Common Career Technical Core – Career Ready Practices

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

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

2. Apply appropriate academic and technical skills.

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

4. Communicate clearly, effectively and with reason.

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

6. Demonstrate creativity and innovation.

7. Employ valid and reliable research strategies.

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

9. Model integrity, ethical leadership and effective management.

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

11. Use technology to enhance productivity.

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

Standards

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

01.0 Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Scientific Visualization.
02.0 Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Scientific Visualization.
03.0 Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Scientific Visualization.
04.0 Demonstrate knowledge, skill, and application of information systems to accomplish job objectives and enhance workplace performance.
05.0 Demonstrate comprehension and communication skills.
06.0 Use technology to enhance the effectiveness of communication skills.
07.0 Develop an awareness of management functions and organizational structures as they relate to today's workplace and employer/ employee roles.
08.0 Practice quality performance in the learning environment and the workplace.
09.0 Incorporate appropriate leadership and supervision techniques, customer service strategies, and standards of personal ethics to accomplish job objectives and enhance workplace performance.
10.0 Apply mathematical operations and processes as well as financial planning strategies to commonly occurring situations in the workplace to accomplish job objectives and enhance workplace performance.
11.0 Assess personal strengths and weaknesses as they relate to job objectives, career exploration, personal development, and life goals.
12.0 Incorporate knowledge gained from individual assessment and job/career exploration to design an individual career plan that reflects the transition from school to work, lifelong learning, and personal and professional goals.
13.0 Demonstrate human relations/interpersonal skills appropriate for the workplace.
14.0 Participate in work-based learning experiences.
15.0 Perform e-mail activities.
16.0 Demonstrate knowledge of different operating systems.
17.0 Demonstrate proficiency navigating the internet, intranet, and the WWW.
18.0 Demonstrate proficiency using HTML commands.
19.0 Demonstrate proficiency in page design applicable to the WWW.
20.0 Demonstrate proficiency using specialized web design software.
21.0 Develop an awareness of the information technology industry.
22.0 Develop an awareness of microprocessors and digital computers.
23.0 Develop an awareness of programming languages.
24.0 Develop an awareness of emerging technologies.
25.0 Demonstrate an understanding of the seven layers of the Open Systems Interface (OSI) model.
26.0 Demonstrate proficiency using common software applications.
27.0 Demonstrate proficiency using specialized software applications.
28.0 Describe scientific & technical visualization.
29.0 Describe the historical significance of scientific & technical visualization.
30.0 Describe the technological advancements of scientific & technical visualization.
31.0 Recognize types of scientific & technical visualization and related careers.

32.0 Classify the categories of visualization tools, providing examples of each category.
33.0 Describe design fundamentals relative to visualization.
34.0 Interpret color and its applications.
35.0 Discuss vector and bitmap images.
36.0 Identify effective 2D presentation techniques.
37.0 Describe 2D software applications and their basic functions.
38.0 Demonstrate effective presentation techniques using appropriate design fundamentals.
39.0 Evaluate methods for displaying data using charts and graphs.
40.0 Describe the steps of a design brief.
41.0 Describe various organizational and diagramming tools. The student will be able to:
42.0 Interpret data for use in charts and graphs.
43.0 Apply data to make an appropriate graph.
44.0 Recognize digital image formats.
45.0 Summarize basic 3D modeling concepts.
46.0 Recognize basic rendering techniques.
47.0 Summarize basic animation techniques.
48.0 Produce a 3D model with animation and rendering.
49.0 Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Scientific Visualization.
50.0 Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Scientific Visualization.
51.0 Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Scientific Visualization.
52.0 Describe 3D modeling.
53.0 Apply basic 3D modeling concepts.
54.0 Render 3D objects to final form.
55.0 Animate 3D objects using dynamic data.
56.0 Render an animated 3D model.
57.0 Interpret different types of spatial data used in 3D visualization and analysis.
58.0 Customize the display of geospatial data.
59.0 Manage, query, and symbolize geospatial data.
60.0 Create, change, and manipulate remotely sensed image data.
61.0 Construct a 3D model of a physical environment.
62.0 Apply advanced tools of visualization.
63.0 Demonstrate advanced principles of visualization.
64.0 Demonstrate advanced visualization processes.
65.0 Demonstrate advanced scientific visualization.
66.0 Demonstrate preparedness for the future**.**

Florida Department of Education
Student Performance Standards

Course Title: **Introduction to Information Technology/Digital Information Technology**
Course Number: **8207310**
Course Credit: **1**

Course Description:
This course is designed to provide an introduction to information technology concepts and careers as well as the impact information technology has on the world, people, and industry and basic web design concepts. The content includes information technology career research; operating systems and software applications; electronic communications including e-mail and Internet services; basic HTML, DHTML, and XML web commands and design; emerging technologies, and Web page design.

Florida Standards			Correlation to CTE Program Standard #
01.0	Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Scientific Visualization.		
	01.01 Key Ideas and Details		
	01.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. LAFS.910.RST.1.1	
	01.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.910.RST.1.2	
	01.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.910.RST.1.3	
	01.02 Craft and Structure		
	01.02.1	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. LAFS.910.RST.2.4	
	01.02.2	Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). LAFS.910.RST.2.5	

Florida Standards			Correlation to CTE Program Standard #
	01.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. LAFS.910.RST.2.6	
01.03	Integration of Knowledge and Ideas		
	01.03.1	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. LAFS.910.RST.3.7	
	01.03.2	Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. LAFS.910.RST.3.8	
	01.03.3	Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. LAFS.910.RST.3.9	
01.04	Range of Reading and Level of Text Complexity		
	01.04.1	By the end of grade 9, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	01.04.2	By the end of grade 10, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 9–10 text complexity band independently and proficiently. LAFS.910.RST.4.10	
02.0	Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Scientific Visualization.		
02.01	Text Types and Purposes		
	02.01.1	Write arguments focused on discipline-specific content. LAFS.910.WHST.1.1	
	02.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.910.WHST.1.2	
02.02	Production and Distribution of Writing		
	02.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.910.WHST.2.4	

Florida Standards			Correlation to CTE Program Standard #
	02.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.910.WHST.2.5	
	02.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. LAFS.910.WHST.2.6	
	02.03	Research to Build and Present Knowledge	
	02.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.910.WHST.3.7	
	02.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. LAFS.910.WHST.3.8	
	02.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.910.WHST.3.9	
	02.04	Range of Writing	
	02.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.910.WHST.4.10	
03.0	Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Scientific Visualization.		
	03.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	
	03.02	Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
	03.03	Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	

Florida Standards	Correlation to CTE Program Standard #
03.04 Model with mathematics. MAFS.K12.MP.4.1	
03.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
03.06 Attend to precision. MAFS.K12.MP.6.1	
03.07 Look for and make use of structure. MAFS.K12.MP.7.1	
03.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
04.0	Demonstrate knowledge, skill, and application of information systems to accomplish job objectives and enhance workplace performance. – The student will be able to:		
04.01	Develop keyboarding skills to enter and manipulate text and data.		
04.02	Describe and use current and emerging computer technology and software to perform personal and business related tasks.		
04.03	Identify and describe communications and networking systems used in workplace environments.		
04.04	Use reference materials such as on-line help, vendor bulletin boards, tutorials, and manuals available for application software.		
04.05	Troubleshoot problems with computer hardware peripherals and other office equipment.		
04.06	Describe ethical issues and problems associated with computers and information systems.		
05.0	Demonstrate comprehension and communication skills. – The student will be able to:		
05.01	Use listening, speaking, telecommunication and nonverbal skills and strategies to communicate effectively with supervisors, co-workers, and customers.		
05.02	Organize ideas and communicate oral and written messages appropriate for information technology environments.		
05.03	Collaborate with individuals and teams to complete tasks and solve information technology problems.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
05.04	Identify, define, and discuss professional information technology terminology appropriate for internal and external communications in an information technology environment.		
05.05	Apply the writing process to the creation of appropriate documents following designated business formats.		
05.06	Demonstrate an awareness of project management concepts and tools (e.g., timelines, deadlines, resource allocation, time management, delegation of tasks, collaboration, etc.).		
06.0	Use technology to enhance the effectiveness of communication skills —The student will be able to:		
06.01	Use database, spreadsheet, presentation software, scheduling, and integrated software packages to enhance communication.		
06.02	Respond to and utilize information derived from multiple sources (e.g., written documents, instructions, e-mail, voice mail) to solve business problems and complete business tasks.		
07.0	Develop an awareness of management functions and organizational structures as they relate to today's workplace and employer/ employee roles. – The student will be able to:		
07.01	Explore, design, implement, and evaluate organizational structures and cultures.		
07.02	Explore and demonstrate an awareness of current trends in business and the employee's role in maintaining productive business environments in today's global workplace.		
07.03	Collaborate with individuals and teams to complete tasks and solve business-related problems and demonstrate initiative, courtesy, loyalty, honesty, cooperation, and punctuality as a team member.		
08.0	Practice quality performance in the learning environment and the workplace. – The student will be able to:		
08.01	Assess personal, peer and group performance and identify and implement strategies for improvement (e.g., organizational skills, note taking/outlining, advance organizers, reasoning skills, problem-solving skills, and decision-making skills).		
08.02	Develop criteria for assessing products and processes that incorporate effective business practices (e.g., time management, productivity, total quality management).		
09.0	Incorporate appropriate leadership and supervision techniques, customer service strategies, and standards of personal ethics to accomplish job objectives and enhance workplace performance. – The student will be able to:		
09.01	Demonstrate awareness of the following workplace essentials: Quality customer service; business ethics; confidentiality of information; copyright violations; accepted workplace rules, regulations, policies, procedures, processes, and workplace safety, and appropriate attire and grooming.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
10.0	Apply mathematical operations and processes as well as financial planning strategies to commonly occurring situations in the workplace to accomplish job objectives and enhance workplace performance. – The student will be able to:	MAFS.912.N-Q.1.3 MAFS.912.S-IC.2.6	
10.01	Analyze, interpret, compile, and demonstrate the ability to present/communicate data in understandable and measurable terms using common statistical procedures.		
10.02	Use common standards of measurement including the metric system in solving work-related or business problems (e.g., length, weight, currency, time).		
10.03	Select and use the correct mathematical processes and tools to solve complex problem situations that are typical of business settings and use formulas when appropriate.		
11.0	Assess personal strengths and weaknesses as they relate to job objectives, career exploration, personal development, and life goals. – The student will be able to:		
11.01	Use personal assessment tools to identify personal strengths and weaknesses related to learning and work environments.		
11.02	Analyze job and career requirements and relate career interests to opportunities in the global economy.		
12.0	Incorporate knowledge gained from individual assessment and job/career exploration to design an individual career plan that reflects the transition from school to work, lifelong learning, and personal and professional goals. – The student will be able to:		
12.01	Research, compare, and contrast information technology career clusters (e.g., characteristics needed, skills required, education required, industry certifications, advantages and disadvantages of information technology careers, the need for information technology workers, etc.).		
12.02	Describe the variety of occupations and professions within the world of information technology including those where information technology is either in a primary focus or in a supportive role.		
12.03	Describe job requirements for the variety of occupations and professions within the global world of information technology.		
12.04	Analyze personal skills and aptitudes in comparison with information technology career opportunities.		
12.05	Refine and implement a plan to facilitate personal growth and skill development related to information technology career opportunities.		
12.06	Develop and maintain an electronic career portfolio, to include, but not limited to the Resume and Letter of Application.		
13.0	Demonstrate human relations/interpersonal skills appropriate for the workplace. – The student will be able to:		
13.01	Accept constructive criticism.		
13.02	Demonstrate personal and interpersonal skills appropriate for the workplace (e.g., responsibility, dependability, punctuality, integrity, positive attitude, initiative, respect for self and others, professional dress, etc.).		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
14.0	Participate in work-based learning experiences. – The student will be able to:		
14.01	Participate in work-based learning experiences in an information technology environment.		
14.02	Discuss the use of technology in an information technology environment.		
15.0	Perform e-mail activities. – The student will be able to:		
15.01	Describe e-mail capabilities and functions.		
15.02	Identify components of an e-mail message.		
15.03	Identify the components of an e-mail address.		
15.04	Identify when to use different e-mail options.		
15.05	Attach a file to an e-mail message.		
15.06	Forward an e-mail message.		
15.07	Use an address book.		
15.08	Reply to an e-mail message.		
15.09	Use the Internet to perform e-mail activities.		
15.10	Identify the appropriate use of e-mail and demonstrate related e-mail etiquette.		
15.11	Identify when to include information from an original e-mail message in a response.		
15.12	Identify common problems associated with widespread use of e-mail.		
16.0	Demonstrate knowledge of different operating systems. – The student will be able to:		
16.01	Identify operating system file naming conventions.		
16.02	Demonstrate proficiency with file management and structure (e.g., folder creation, file creation, backup, copy, delete, open, save).		
16.03	Demonstrate a working knowledge of standard file formats.		
16.04	Explain the history and purpose of various operating systems (e.g., DOS, Windows, Mac, and Unix/Linux).		
17.0	Demonstrate proficiency navigating the internet, intranet, and the WWW. – The student will be able to:		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
17.01	Identify and describe Web terminology.		
17.02	Demonstrate proficiency in using the basic features of GUI browsers (e.g., setting bookmarks, basic configurations, e-mail configurations, address book).		
17.03	Define Universal Resource Locators (URLs) and associated protocols (e.g., .com, .org, .edu, .gov, .net, .mil).		
17.04	Describe and observe Internet/Intranet ethics and copyright laws and regulatory control.		
17.05	Trace the evolution of the Internet from its inception to the present and into the future.		
17.06	Demonstrate proficiency using search engines (e.g., Yahoo!, Google, Northern Light, Lycos, Excite, etc.).		
17.07	Demonstrate proficiency using various web tools (e.g., downloading of files, transfer of files, telnet, PDF, etc.).		
17.08	Identify effective Boolean search strategies.		
18.0	Demonstrate proficiency using html commands. – The student will be able to:		
18.01	Identify elements of a Web page.		
18.02	Describe individual Web page layouts and content (e.g., writing for the Web, Web structure).		
18.03	Define basic HTML terminology.		
18.04	Analyze HTML source code developed by others.		
18.05	Create Web pages using basic HTML tags (e.g., links, lists, character styles, text alignment, tables).		
18.06	Use storyboarding techniques for subsequent Web pages (e.g., linear, hierarchical).		
18.07	Edit and test HTML documents for accuracy and validity.		
18.08	Use basic functions of WYSIWYG editors.		
18.09	Use basic functions of HTML, DHTML, and XML editors and converters.		
18.10	Enhance web pages through the addition of images and graphics including animation.		
19.0	Demonstrate proficiency in page design applicable to the WWW. – The student will be able to:		
19.01	Develop an awareness of acceptable Web page design, including index pages in relation to the rest of the Web site.		
19.02	Describe and apply color theory as it applies to Web page design (e.g., background and text color).		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
19.03	Access and digitize graphics through various resources (e.g., scanner, digital cameras, on-line graphics, clipart, CD-ROMs).		
19.04	Use image design software to create and edit images.		
19.05	Demonstrate proficiency in publishing to the Internet.		
19.06	Demonstrate proficiency in adding downloadable forms to web pages.		
19.07	Explain the need for web-based applications.		
20.0	Demonstrate proficiency using specialized web design software. – The student will be able to:		
20.01	Compare and contrast various specialized web design software (e.g., Flash, Shockwave, GoLive, Director, etc.).		
20.02	Demonstrate proficiency using use of various specialized web design software (e.g., Flash, Shockwave, GoLive, Director, etc.).		
21.0	Develop an awareness of the information technology industry. – The student will be able to:		
21.01	Explain how information technology impacts the operation and management of business and society.		
21.02	Explain the emergence of e-commerce and e-government and the potential impact on business and society.		
21.03	Explain the emergence of a paperless society.		
22.0	Develop an awareness of microprocessors and digital computers. – The student will be able to:		
22.01	Describe the evolution of the digital computer.		
22.02	Explain the general architecture of a microcomputer system.		
22.03	Explain the evolution of microprocessors.		
22.04	Explain software hierarchy and its impact on microprocessors.		
22.05	Explain the need for and use of peripherals.		
22.06	Demonstrate proficiency using peripherals.		
22.07	Identify the basic concepts of computer maintenance and upgrades.		
22.08	Differentiate between diagnosing and troubleshooting.		
23.0	Develop an awareness of programming languages. – The student will be able to:		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
23.01	Explain the history of programming languages.		
23.02	Explain the need for and use of compilers.		
23.03	Explain how compilers work.		
23.04	Identify the three types of programming design approaches (e.g., top-down, structured, and object-oriented).		
24.0	Develop an awareness of emerging technologies. – The student will be able to:		
24.01	Compare and contrast various methods of evaluation for emerging technologies.		
24.02	Demonstrate knowledge of the process of planning upgrades and changeovers.		
24.03	Compare and contrast emerging technologies and describe how they impact business in the global marketplace (e.g., wireless, wireless web, cell phones, portables/handhelds, smart appliances, home networks, peer-to-peer, etc.).		
25.0	Demonstrate an understanding of the seven layers of the Open Systems Interface (OSI) model. – The student will be able to:		
25.01	Identify how types of networks and how they work.		
25.02	Identify the role of servers and clients on a network.		
25.03	Identify benefits and risks of networked computing.		
25.04	Identify the relationship between computer networks and other communications networks (i.e. telephone systems).		
25.05	Identify Intranets, Extranets and how they relate to the Internet.		
25.06	Demonstrate basic understanding of network administration.		
25.07	Describe the evolution of OSI from its inception to the present and into the future.		
25.08	Explain the interrelations of the seven layers of the Open Systems Interface (OSI) as it relates to hardware and software.		
26.0	Demonstrate proficiency using common software applications. – The student will be able to:		
26.01	Compare and contrast the appropriate use of various software applications (e.g., word processing, desktop publishing, graphics design, web browser, e-mail, presentation, database, scheduling, financial management, Java applet, music, etc.).		
26.02	Demonstrate proficiency in the use of various software applications (e.g., word processing, desktop publishing, graphics design, web browser, e-mail, presentation, database, scheduling, financial management, Java applet, music, etc.).		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
27.0	Demonstrate proficiency using specialized software applications. – The student will be able to:		
27.01	Compare and contrast the appropriate use of specialized software applications (e.g., (OLTP, Computer Aided Design, Computer Aided Manufacturing, 3D animation process control, materials management, etc.).		
27.02	Demonstrate awareness of specialized software applications (e.g., OLTP, Computer Aided Design, Computer Aided Manufacturing, 3D animation, process control, materials management, etc.)		
27.03	Demonstrate the ability to incorporate digital sound.		

Florida Department of Education
Student Performance Standards

Course Title: **Principles of Scientific Visualization**
Course Number: **9400110**
Course Credit: **1**

Course Description:
This course provides students with instruction in the evolution and underlying principles of scientific visualization, including two-dimensional representation of scientific and other forms of data. Included in the content is the use of color and other graphical elements such as vector and bitmap images in different presentation techniques. Students will also learn about the use of charts and graphs in representing data and the software tools used to produce them. The ultimate output of this course is a design portfolio created by the student from a scenario. The portfolio should include a narrative description of the scenario, the approach to data collection, resulting charts and graphs, and an interpretation of each chart/graph. Research references should be cited appropriately. Consideration should be given to having students produce the portfolio using presentation software.

Florida Standards			Correlation to CTE Program Standard #
01.0	Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Scientific Visualization.		
	01.01 Key Ideas and Details		
	01.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. LAFS.910.RST.1.1	
	01.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.910.RST.1.2	
	01.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.910.RST.1.3	
	01.02 Craft and Structure		
	01.02.1	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. LAFS.910.RST.2.4	

Florida Standards			Correlation to CTE Program Standard #
	01.02.2	Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). LAFS.910.RST.2.5	
	01.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. LAFS.910.RST.2.6	
01.03	Integration of Knowledge and Ideas		
	01.03.1	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. LAFS.910.RST.3.7	
	01.03.2	Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. LAFS.910.RST.3.8	
	01.03.3	Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. LAFS.910.RST.3.9	
01.04	Range of Reading and Level of Text Complexity		
	01.04.1	By the end of grade 9, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	01.04.2	By the end of grade 10, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 9–10 text complexity band independently and proficiently. LAFS.910.RST.4.10	
02.0	Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Scientific Visualization.		
02.01	Text Types and Purposes		
	02.01.1	Write arguments focused on discipline-specific content. LAFS.910.WHST.1.1	
	02.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.910.WHST.1.2	

Florida Standards			Correlation to CTE Program Standard #
02.02	Production and Distribution of Writing		
	02.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.910.WHST.2.4	
	02.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.910.WHST.2.5	
	02.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. LAFS.910.WHST.2.6	
02.03	Research to Build and Present Knowledge		
	02.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.910.WHST.3.7	
	02.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. LAFS.910.WHST.3.8	
	02.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.910.WHST.3.9	
02.04	Range of Writing		
	02.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.910.WHST.4.10	
03.0	Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Scientific Visualization.		
	03.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	

Florida Standards	Correlation to CTE Program Standard #
03.02 Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
03.03 Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
03.04 Model with mathematics. MAFS.K12.MP.4.1	
03.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
03.06 Attend to precision. MAFS.K12.MP.6.1	
03.07 Look for and make use of structure. MAFS.K12.MP.7.1	
03.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
28.0 Describe scientific & technical visualization. – The student will be able to:		
28.01 Define scientific and technical visualization and provide examples of each.		
28.02 Explain the importance of scientific visualization and its applicability to various industries.		
28.03 Provide examples of 2-D and 3D rendered visualizations.		
29.0 Describe the historical significance of scientific & technical visualization. – The student will be able to:		
29.01 Describe the evolution of drawings from cave through perspective drawings to photography, television, and the Internet.		
29.02 Define and describe the elements contained on various types of maps (e.g., road, topographic, aeronautical, weather, concept, and gene).		
30.0 Describe the technological advancements of scientific & technical visualization. – The student will be able to:		SC.912.L.14.4; SC.912.E.5.8; SC.912.P.10.22
30.01 Describe x-ray crystallography and its importance to modern visualization.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	30.02 Compare the differences between microscopes and the types of telescopes (radio and light) relative to their use in scientific visualization.		
	30.03 Describe how the advancement of computer technology has impacted scientific visualization.		
	30.04 Explain how DNA fingerprinting relates to scientific visualization.		
	30.05 Describe magnetic resonance imaging (MRI) and how it benefits from scientific visualization.		
	30.06 Describe how geospatial information systems and remote sensing relate to scientific visualization.		
	30.07 Define virtual reality and relate it to simulations and holograms.		
31.0	Recognize types of scientific & technical visualization and related careers. – The student will be able to:		
	31.01 Describe careers related to scientific visualization that exist in various industries.		
	31.02 Describe careers related to technical visualization that exist in various industries.		
32.0	Classify the categories of visualization tools, providing examples of each category. – The student will be able to:		SC.912.N.2.5
	32.01 Describe basic computer hardware and software components and characteristics.		
	32.02 Interpret the use and application of different types of software programs.		
	32.03 Summarize the ethical use of electronic media.		
	32.04 Demonstrate basic computer knowledge by writing a proposal for a 3-D animation project to include:		
	a) A chart or spreadsheet comparing three software applications in terms of hardware requirements and software cost.		
	b) List describing input and output devices chosen and rationale.		
	c) Written justification for the proposed solution (2-3 paragraphs).		
33.0	Describe design fundamentals relative to visualization. – The student will be able to:		
	33.01 Define the three aspects of design.		
	33.02 Describe the three principles of design (balance, rhythm, proportion).		
	33.03 Describe the three methods of design (emphasis, unity, and repetition).		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	33.04 Define and describe the six elements of design (lines, shapes, color, texture, space, and size)		
34.0	Interpret color and its applications. – The student will be able to:		
	34.01 Describe the relationships between additive and subtractive color and their implications to absorbed, reflected, transmissive, transparent, and opaque colors.		
	34.02 Describe how mood is communicated using color and give examples.		
	34.03 Describe the HSV (Hue, Saturation, Values) Model and its role in color mixing and harmony.		
	34.04 Define and explain the use of complimentary color schemes.		
	34.05 Describe and give examples of how visual communication uses images and text to convey information and persuade.		
35.0	Discuss vector and bitmap images. – The student will be able to:		
	35.01 Define the characteristics of vector images.		
	35.02 Describe the advantages of vector images over raster images.		
	35.03 Describe the disadvantages of vector images compared to raster images.		
	35.04 Compare and contrast line art, complex line art, high detail line art, and colored vector images.		
	35.05 Identify the native file format for common software used to create vector images (Corel Draw, Adobe Illustrator, and Adobe Photoshop).		
	35.06 Define the characteristics of raster (bitmap) images.		
	35.07 Describe the advantages of raster images over vector images.		
	35.08 Describe the disadvantages of vector images compared to raster images.		
	35.09 Compare the three types of raster images.		
	35.10 Explain how the color depth of a raster image pixel affects file size.		
	35.11 Define image resolution and explain why it only applies to raster images.		
36.0	Identify effective 2D presentation techniques. – The student will be able to:		
	36.01 Identify the fundamental elements used to produce visual aids (images, words, shapes, and color)		
	36.02 Explain how theme, focus, balance, weight, and placement affect visual representations.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
36.03	Explain the differences in presentation between demonstration, setting, and product along.		
36.04	Describe common conceptual techniques employed in presentations (picture windows, type specimen, copy heavy, Mondrian, omnibus, multi-panel or cartoon, and silhouette).		
37.0	Describe 2D software applications and their basic functions. – The student will be able to:		
37.01	Identify and describe the purpose of the various tools used in a basic 2D graphics application (select, knife, magnify/zoom, text, fill, pan, eyedropper, gradient blend, and crop).		
37.02	Identify and describe various drawing techniques used in 2D representations, to include Bezier curves, closed and open splines, control points, layering, welding, grouping, desktop, grids and snaps, brushes and brush effects, line thickness, rotation, transparency, and printing).		
37.03	Create a slide presentation (using software such as Microsoft PowerPoint) that employs backgrounds, master slides, images, movies, slide transitions, internal navigation, and timed sequencing.		
37.04	Use layout concepts in creating a slide presentation; including use of a common background, the 6-6-6 rule, maximum of two images per slide, appropriate white space, adheres to SAFE design methods, and appropriate text size.		
38.0	Demonstrate effective presentation techniques using appropriate design fundamentals. – The student will be able to:		SC.912.L.15.4; 17.6
38.01	Design and produce a flyer or brochure about an organism for use in a high school biology or other science program.		
38.02	Conduct research on a target organism for a flyer or brochure and include parts of the organism, habitat, feeding habits, special adaptations, and role in the environment.		
38.03	Create two original images of the target organism in 2D software.		
38.04	Identify the image for use as the dominant element in the layout and include labels and tags.		
38.05	Sketch the layout of the flyer or brochure and select the appropriate typeface and color theme.		
38.06	Size images to fit provided in the layout design.		
38.07	Design a logo for use as an identity mark.		
39.0	Evaluate methods for displaying data using charts and graphs. – The student will be able to:	MAFS.912.S-IC.2.6	
39.01	Recognize different types of charts and their uses and advantages.		
39.02	Describe the characteristics and uses of bar charts.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
39.03 Describe the characteristics and uses of a stacked column chart.		
39.04 Describe the characteristics and uses of a line (x-y) graph.		
39.05 Describe the characteristics and uses of a pie chart.		
39.06 Describe the characteristics and uses of a scatter plot.		
39.07 Describe the characteristics and uses of a histogram.		
39.08 Identify and describe the different parts of a chart (axis, title, legend, labels).		
39.09 Describe the basic rules for chart construction.		
40.0 Describe the steps of a design brief. – The student will be able to:		SC.912.N.1.1
40.01 Describe the problem identification and definition step of producing a design brief.		
40.02 Describe the plan of work step of producing a design brief.		
40.03 Describe the literature review step of producing a design brief.		
40.04 Describe the hypothesis step of producing a design brief.		
40.05 Describe the data collection step of producing a design brief.		
40.06 Describe the visualization selection step of producing a design brief.		
40.07 Describe the self-evaluation step of producing a design brief.		
40.08 Describe the IDEAL problem-solving process (Identify the problem, Define the plan of work, Explore the problem through research, Act on the possible solution, Look back at the process).		
40.09 Describe each aspect of the SAFE design process (Simple, Appropriate, Functional, and Economical).		
40.10 Compare data-driven design to concept-driven design.		
41.0 Describe various organizational and diagramming tools. The student will be able to:		
41.01 Describe flowcharting and its use in visualization.		
41.02 Identify and describe the basic flowcharting shapes.		
41.03 Describe brainstorming and its role in visualization.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
41.04 Describe the nominal group technique and its role in visualization.		
41.05 Define and explain the use of Venn diagramming in visualization.		
42.0 Interpret data for use in charts and graphs. – The student will be able to:	MAFS.912.S-IC.2.6	SC.912.N1.1; SC.912.P.12.1
42.01 Compare and contrast the 2D and 3D differences in the Cartesian coordinate system.		
42.02 Identify and give examples of direct or positive relationships.		
42.03 Identify and give examples of inverse or negative relationships.		
42.04 Read data values on charts and graphs and plot a regression line.		
42.05 Describe and give examples of the following data types:		
a) Ordinal data		
b) Nominal data		
c) Scalar quantities		
d) Vector quantities		
e) Qualitative data		
f) Quantitative data		
g) Mean		
h) Median		
i) Mode		
j) Independent variable		
k) Dependent variable		
l) Control		
m) Empirically or computationally derived data		
43.0 Apply data to make an appropriate graph. – The student will be able to:	MAFS.912.S-IC.2.6	SC.912.N.1.1, 7; SC.912.L.15.13; 16.2; 17.4, 9; 18.7; SC.912.P.10.8

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
43.01	Select and create a graph or chart to appropriately illustrate a data set depicting rates of photosynthesis (time in minutes and rate in cubic millimeters).		
43.02	Select and create a graph or chart to appropriately illustrate a data set depicting number of red eyes in fruit flies over generations (frequency of x).		
43.03	Select and create a graph or chart to appropriately illustrate a data set depicting the diet of the coyote in the summer (diet item and percent).		
43.04	Select and create a graph or chart to appropriately illustrate a data set depicting length of cottonwood leaves (length range and quantity).		
43.05	Select and create a graph or chart to appropriately illustrate a data set depicting energy expenditures in the production of corn in 1945 and 1970 (energy input and 1945 and 1970 kcal/m^2 units).		
43.06	Select and create a graph or chart to appropriately illustrate a data set depicting income differences between men and women with different education backgrounds (education level and men and women		
44.0	Recognize digital image formats. – The student will be able to:		
44.01	Explain the difference between native and non-native file formats.		
44.02	Describe the difference between lossy and lossless file compression.		
44.03	Describe the characteristics, advantages, disadvantages, and uses of various image file formats (TIFF, JPEG, GIF, and BMP).		
44.04	Describe the characteristics, advantages, disadvantages, and uses of various audio and video file formats (WAV, AVI, MPEG, MP3, SWF).		
45.0	Summarize basic 3D modeling concepts. – The student will be able to:		SC.912.P.12.6
45.01	Compare and contrast 3D modeling software applications that offer a perspective view, an orthographic view, or a combination.		
45.02	Explain how coordinate systems are used to locate objects in three dimensional space.		
45.03	Describe basic geometric shapes available in 3D modeling software (sphere, cube, cylinder, torus, cone, plane).		
45.04	Describe basic shapes available in 2D modeling software (arcs, ellipses, circles, curve, freehand curves, polygons, splines).		
45.05	Define the parameters used for determining the size, placement, and orientation of a modeling object.		
45.06	Describe the Boolean modeling operations of union, subtraction, and intersection.		
45.07	Describe how extrusion or sweeping techniques transform 2D objects into 3D objects.		
45.08	Describe the lofting technique for creating 3D objects.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
45.09	Describe the revolve or lathe techniques for animating a 2D object and give examples of their application.		
45.10	Describe the scale, rotate, and move actions that comprise the transformation technique for animating a 3D object.		
45.11	Describe the object parameters modified using the deformation technique and provide examples of its use.		
45.12	Describe the copy or clone technique.		
45.13	Describe the mirror technique.		
45.14	Compare and contrast the wire frame and sold viewing tools.		
45.15	Describe basic viewing navigation tools such as zoom, rotate, and panning.		
45.16	Define plug-in and describe how it extends the capability of the modeling program.		
45.17	Describe the export function and its value when producing visualizations.		
46.0	Recognize basic rendering techniques. – The student will be able to:		SC.912.P.10.19; SC.912.E.6.2
46.01	Define rendering and describe its role in 3D modeling.		
46.02	Define texture mapping and describe its role in 2D and 3D modeling.		
46.03	Define UV mapping and describe its role in rendering visualizations.		
46.04	Define bump mapping and describe its role in rendering visualizations.		
46.05	Describe the role of lighting in rendering a 3D visualization.		
47.0	Summarize basic animation techniques. – The student will be able to:		
47.01	Describe how the human brain processes images that make up an animation.		
47.02	Identify the NTSC frame rate.		
47.03	Identify the PAL frame rate.		
47.04	Identify the standard frame rate for motion pictures.		
47.05	Calculate the number of images required a one second of animation.		
47.06	Describe the use of scenes, layers, keyframes, and tweens in animation.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
47.07	Describe stop-action animation.		
47.08	Describe the steps or processes involved in creating a computer animation.		
47.09	Define storyboarding and describe its role in computer animation.		
48.0	Produce a 3D model with animation and rendering. – The student will be able to:		SC.912.N.1.1; 7; SC.912.L.16.7, 15
48.01	Select a topic suitable for animation (e.g., lytic cycle of a T4 bacteriophage virus, a scientific concept or law, replication of a famous experiment, explain how something works, explain a disease) and conduct background research.		
48.02	Create a script and storyboard for the animation.		
48.03	Use a 3D modeling program to build the appropriate graphics to be used in the animation scenes.		
48.04	Create a 3-4 second animation for each scene in the animation.		
48.05	Render each scene and export to an appropriate file format (e.g., AVI, MPEG, MP3, SWF).		
48.06	Integrate the animation scene into a slide presentation using an application such as PowerPoint.		

Florida Department of Education
Student Performance Standards

Course Title: **Data Modeling**
Course Number: **9400120**
Course Credit: **1**

Course Description:
In this course, students learn about the nature of data and various tools and techniques used in different industries to retrieve, render, and display 2-D and 3-D data. Students are provided instruction in the concepts and techniques associated with rendering dynamic or changing data as animation. They are also introduced to various imaging techniques used in different industries, their implications, applications, and challenges. The ultimate output of this course is a portfolio created by the student from a scenario related to the student's industry of interest. The portfolio should include a narrative description of the scenario, the approach to data collection, a description of the tools and techniques used for rendering, and an interpretation of each data model. Research references should be cited appropriately. Given the advanced nature of this course, consideration should be given to having students produce the portfolio using presentation software.

Florida Standards			Correlation to CTE Program Standard #
49.0	Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Scientific Visualization.		
	49.01 Key Ideas and Details		
	49.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. LAFS.1112.RST.1.1	
	49.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.1112.RST.1.2	
	49.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.1112.RST.1.3	
	49.02 Craft and Structure		
	49.02.1	Determine the meaning of symbols key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. LAFS.1112.RST.2.4	
	49.02.2	Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. LAFS.1112.RST.2.5	

Florida Standards			Correlation to CTE Program Standard #
	49.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. LAFS.1112.RST.2.6	
49.03	Integration of Knowledge and Ideas		
	49.03.1	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g. quantitative data, video, multimedia) in order to address a question or solve a problem. LAFS.1112.RST.3.7	
	49.03.2	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. LAFS.1112.RST.3.8	
	49.03.3	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. LAFS.1112.RST.3.9	
49.04	Range of Reading and Level of Text Complexity		
	49.04.1	By the end of grade 11, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	49.04.2	By the end of grade 12, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 11–CCR text complexity band independently and proficiently. LAFS.1112.RST.4.10	
50.0	Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Scientific Visualization.		
50.01	Text Types and Purposes		
	50.01.1	Write arguments focused on discipline-specific content. LAFS.1112.WHST.1.1	
	50.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.1112.WHST.1.2	
50.02	Production and Distribution of Writing		

Florida Standards			Correlation to CTE Program Standard #
	50.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.1112.WHST.2.4	
	50.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.1112.WHST.2.5	
	50.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. LAFS.1112.WHST.2.6	
50.03	Research to Build and Present Knowledge		
	50.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.1112.WHST.3.7	
	50.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. LAFS.1112.WHST.3.8	
	50.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.1112.WHST.3.9	
50.04	Range of Writing		
	50.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.1112.WHST.4.10	
51.0	Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Scientific Visualization.		
	51.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	
	51.02	Reason abstractly and quantitatively. MAFS.K12.MP.2.1	

Florida Standards	Correlation to CTE Program Standard #
51.03 Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
51.04 Model with mathematics. MAFS.K12.MP.4.1	
51.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
51.06 Attend to precision. MAFS.K12.MP.6.1	
51.07 Look for and make use of structure. MAFS.K12.MP.7.1	
51.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
52.0 Describe 3D modeling. – The student will be able to:		SC.912.E.6.2
52.01 Define 3D modeling.		
52.02 Compare and contrast the solid and shell categories of 3D models.		
52.03 Describe the polygonal, NURBS, splines & patches, primitives, and sculpting methods of 3D modeling.		
52.04 Describe the constructive solid geometry method of 3D modeling and give examples of its value to data visualization.		
52.05 Describe the implicit surfaces (isosurfaces) method of 3D modeling and give examples of its value to data visualization.		
52.06 Describe the subdivision surfaces method of 3D modeling and give examples of its value to data visualization.		
52.07 Identify common 2D and 3D modeling tools.		
53.0 Apply basic 3D modeling concepts. – The student will be able to:		SC.912.P.10.19
53.01 Manipulate primitive modeling views by using the three Boolean operations (union, subtract, and intersect) to create 3D objects.		
53.02 Utilize revolve or extrude commands to create 3D objects from 2D shapes.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
53.03	Enhance a 3D object's realism by using the shading technique.		
53.04	Use 3D orbit to rotate objects for better visualization.		
53.05	Adjust the lighting of a 3D object to enhance the visualization.		
54.0	Render 3D objects to final form. – The student will be able to:		SC.912.P.10.19
54.01	Use texture mapping in rendering a 3D object.		
54.02	Use UV mapping in rendering visualizations.		
54.03	Use bump mapping in rendering visualizations.		
54.04	Use lighting in rendering a 3D visualization.		
55.0	Animate 3D objects using dynamic data. – The student will be able to:		
55.01	Assign values to points of a 3D object based on information from a database.		
55.02	Create a script and storyboard for the animation.		
55.03	Use a 3D modeling program to alter the dataset to create an animated 3D object.		
55.04	Vary the data if fixed ways to observe/analyze results.		
55.05	Integrate the animation scene into a slide presentation using an application such as PowerPoint.		
56.0	Render an animated 3D model. – The student will be able to:		SC.912.L.16.14, 17
56.01	Select a topic suitable for animation (e.g., lytic cycle of a T4 bacteriophage virus, a scientific concept or law, replication of a famous experiment, explain how something works, explain a disease) and conduct background research.		
56.02	Create a script and storyboard for the animation, including identifying needed data.		
56.03	Use a 3D modeling program to build the appropriate graphics and corresponding data to be used in the animation scenes.		
56.04	Create a data-driven, 3-4 second animation for each scene in the animation.		
56.05	Render each scene and export to an appropriate file format (e.g., AVI, MPEG, MP3, SWF).		
56.06	Integrate the animation scene into a slide presentation using an application such as PowerPoint.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
57.0	Interpret different types of spatial data used in 3D visualization and analysis. – The student will be able to:		
57.01	Explore methods of obtaining, downloading, and extracting free data using the Internet.		
57.02	Build 3D datasets.		
57.03	Display 2D features onto a 3D surface.		
57.04	Create shapefiles to view in a 3D environment.		
57.05	Construct a 3D model of a physical environment.		
57.06	Display georeferenced data measurements in 3D.		
57.07	Apply Interpolation methods.		
57.08	Utilize georeferenced 2D data in a 3D environment.		
57.09	Create contour lines in a 3D environment.		
58.0	Customize the display of geospatial data. – The student will be able to:		SC.912.E.6.1; SC.912.N.1.1
58.01	Edit Layer Properties.		
58.02	Create Layer Files.		
58.03	Edit an attribute table by adding a new field with calculating values.		
58.04	Perform relates and joins with data tables.		
59.0	Manage, query, and symbolize geospatial data. – The student will be able to:	MAFS.912.S-IC.2.6	SC.912.E.6.5; SC.912.N.1.1
59.01	Label features.		
59.02	Insert, copy, and paste data into new data frames.		
59.03	Create graphs and reports from data.		
60.0	Create, change, and manipulate remotely sensed image data. – The student will be able to:		SC.912.P.12.2
60.01	View single band and multispectral images.		
60.02	Perform various manipulations to an image including creating a subset of an image, mosaic two georeferenced images, and orthorectification.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
60.03	Perform image analysis by orthorectifying non-georeferenced digital images to existing map features.		
60.04	Enhance an image by adjusting the brightness and contrast, adjusting the histogram, applying custom histogram stretches, sharpening and smoothing its appearance.		
60.05	Convert an image from color IR to natural color by performing a resolution merge.		
61.0	Construct a 3D model of a physical environment. – The student will be able to:		
61.01	Display georeferenced data measurements in 3D.		
61.02	Apply Interpolation methods.		
61.03	Utilize georeferenced 2D data in a 3D environment.		
61.04	Create contour lines in a 3D environment.		

Florida Department of Education
Student Performance Standards

Course Title: **Advanced Applications in Scientific Visualization**
Course Number: **9400130**
Course Credit: **1**

Course Description:
This course provides students with instruction in advanced imaging techniques relative to both static and dynamic visualization. In addition to digital imaging, students receive instruction in video editing and the integration of animated 3-D rendered data model. Students will create visualizations related to biological cells, plate tectonics, DNA and gel electrophoresis, and one of simple machines. The ultimate output of this course is a portfolio created by the student from a scenario. The portfolio should include a narrative description of the scenario, the approach to data collection, resulting renderings, and an interpretation of each chart/graph. Research references should be cited appropriately. Given the advanced nature of this course and the need to illustrate skills in dynamic renderings, students should produce the portfolio using presentation software suitable for dissemination via the Internet.

Florida Standards			Correlation to CTE Program Standard #
49.0	Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Scientific Visualization.		
	49.01 Key Ideas and Details		
	49.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. LAFS.1112.RST.1.1	
	49.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.1112.RST.1.2	
	49.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.1112.RST.1.3	
	49.02 Craft and Structure		
	49.02.1	Determine the meaning of symbols key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. LAFS.1112.RST.2.4	
	49.02.2	Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. LAFS.1112.RST.2.5	

Florida Standards			Correlation to CTE Program Standard #
	49.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. LAFS.1112.RST.2.6	
49.03	Integration of Knowledge and Ideas		
	49.03.1	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g. quantitative data, video, multimedia) in order to address a question or solve a problem. LAFS.1112.RST.3.7	
	49.03.2	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. LAFS.1112.RST.3.8	
	49.03.3	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. LAFS.1112.RST.3.9	
49.04	Range of Reading and Level of Text Complexity		
	49.04.1	By the end of grade 11, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	49.04.2	By the end of grade 12, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 11–CCR text complexity band independently and proficiently. LAFS.1112.RST.4.10	
50.0	Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Scientific Visualization.		
50.01	Text Types and Purposes		
	50.01.1	Write arguments focused on discipline-specific content. LAFS.1112.WHST.1.1	
	50.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.1112.WHST.1.2	
50.02	Production and Distribution of Writing		

Florida Standards			Correlation to CTE Program Standard #
	50.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.1112.WHST.2.4	
	50.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.1112.WHST.2.5	
	50.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. LAFS.1112.WHST.2.6	
50.03	Research to Build and Present Knowledge		
	50.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.1112.WHST.3.7	
	50.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. LAFS.1112.WHST.3.8	
	50.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.1112.WHST.3.9	
50.04	Range of Writing		
	50.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.1112.WHST.4.10	
51.0	Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Scientific Visualization.		
	51.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	
	51.02	Reason abstractly and quantitatively. MAFS.K12.MP.2.1	

Florida Standards	Correlation to CTE Program Standard #
51.03 Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
51.04 Model with mathematics. MAFS.K12.MP.4.1	
51.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
51.06 Attend to precision. MAFS.K12.MP.6.1	
51.07 Look for and make use of structure. MAFS.K12.MP.7.1	
51.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
62.0 Apply advanced tools of visualization. – The student will be able to:		
62.01 Describe how computers store information.		
62.02 Define how to apply pixel values to digital images.		
62.03 Apply pixel values to digital images.		
62.04 Identify trends in scientific and technical visualization tools.		
63.0 Demonstrate advanced principles of visualization. – The student will be able to:		
63.01 Recognize advanced 2D design concepts.		
63.02 Describe advanced imaging techniques.		
63.03 Identify advanced presentation techniques.		
63.04 Demonstrate advanced presentation techniques.		
63.05 Identify basic web page design.		
63.06 Demonstrate basic web page design.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
64.0 Demonstrate advanced visualization processes. – The student will be able to:		
64.01 Summarize advanced 3D modeling.		
64.02 Interpret advanced animation techniques.		
64.03 Describe video-editing techniques.		
64.04 Demonstrate video-editing techniques.		
65.0 Demonstrate advanced scientific visualization. – The student will be able to:		SC.912.L.14.1, 2; 16.3, SC.912.E.6.3
65.01 Recognize cells and their parts.		
65.02 Create a visualization of the cell and its parts.		
65.03 Recognize plate tectonics.		
65.04 Create a visualization of plate tectonics.		
65.05 Describe DNA and gel electrophoresis.		
65.06 Create a visualization of DNA and gel electrophoresis.		
65.07 Explain different simple machines.		
65.08 Create a visualization of simple machines.		
65.09 Create an advanced visualization.		
66.0 Demonstrate preparedness for the future**.** – The student will be able to:		
66.01 Summarize different types of portfolios.		
66.02 Synthesize an electronic portfolio.		
66.03 Create an electronic portfolio of their work.		

Florida Department of Education
Student Performance Standards

Course Title: **SciViz Internship**
Course Number: **9400140**
Course Credit: **1**

Course Description:
The SciViz internship course provides students with the opportunity to stimulate their career interest, to demonstrate human relations, communications, and employability skills, and to gain professional job experience related to a career in scientific visualization related to an industry of their choosing. Students will enhance and apply instructional competencies learned in the classroom through the internship experience. For this six to eight-week internship, the rules, guidelines, and requirements specified in the Florida Department of Education Cooperative Education Manual apply.

This manual is available online in Microsoft Word format at http://www.fldoe.org/core/fileparse.php/3/urlt/steps-manual.pdf.

The internship must include the following components:

Pre-Placement Planning Conference

The student, teacher, and the workplace-learning site supervisor must participate in a pre-placement conference. It is also recommended that the parent/guardian of the student be included in the pre-placement planning conference. Pre-placement planning is essential in designing learning experiences that are appropriate for each individual's learning needs and career interests. Also, it is critical that all parties involved understand and agree on time schedules, expectations, training/learning activities, and evaluation methods. The internship agreement should be signed by the student, teacher/coordinator, parent/guardian, and the workplace-learning site supervisor.

Workplace-Learning Site

The following criteria should be met when choosing the workplace-learning site:

1. The workplace experience must allow experiences that utilize both skills and knowledge directly related to the student's career goal and the career and technical course/program in which the student is enrolled or has completed.
2. The workplace experience must provide opportunities for rotation through a wide variety of increasingly responsible experiences beyond routine activities.
3. The workplace experience must provide skilled workplace-learning site supervisors and/or mentors who are interested and willing to assist the student.
4. The workplace experience must provide a safe and ethically sound environment with up-to-date facilities and equipment. The workplace experience must adhere to all state and federal laws and rules regarding the employment of minors. The workplace experience must not displace a paid employee.
5. The student does not have to be paid.
6. Timecards documenting the time spent at the workplace-learning site must be maintained.

Job Experience

This component shall provide a match between the student's career goal and a work-based situation that will provide exposure to the broad aspects of the selected industry. The assigned tasks should allow for a progression of and rotation through experiences requiring a variety of skills and knowledge at increasingly higher levels as relates to the student's career major.

Workplace-Learning Plan

A workplace-learning plan must be developed and implemented for each student. The student performance standards of the workplace-learning plan should include an outline of learning objectives, methods of learning, activities/responsibilities, time required, provisions for supervision, and method(s) of student evaluation. The workplace-learning plan must be signed by the student, teacher/coordinator, parent/guardian, and the workplace-learning site supervisor.

Weekly Class or Seminar

Students in the SciViz internship must meet a minimum of once per week for the purpose of related instruction and developmental activity. These seminars should provide a forum for students to share and learn from each other's experiences through discussion and group activities/projects. Faculty should also use this time to reinforce the application of subject matter in the workplace-learning setting. Students should be encouraged to reflect upon and personalize their experiences through individual journals and also through interaction with the teacher/coordinator and the workplace-learning site supervisor.

Supervision/Site Visits

Teacher/Coordinators of the SciViz internship must monitor and support learning while students are in the field. Teacher/coordinators should visit the workplace-learning site as frequently as once every two weeks, but not less than once per month so that students may be observed performing all facets of their workplace-learning experiences. Students must also be evaluated a minimum of once per grading period the workplace-learning site supervisor. The evaluation should assess how well the student is progressing towards goals established by the student, teacher/coordinator, and workplace-learning site supervisor. Portfolio assessment is a recommended method of student assessment.

For every 20 students (or portion thereof) enrolled in this internship course, the teacher/coordinator should be given one hour of coordination release time per day for the purposes of visiting students on the job and managing the cooperative method of instruction.

Additional Information

Equipment List

Recommendations Per Student

Hardware

- Intel® Pentium® 4, 2.80GHz, 1 GB RAM
- 40 GB hard drive
- Video/graphics accelerator card to match animation software
- 17” monitor
- 10/100/1000 MB/sec network card
- Windows XP or newer
- Network card
- USB serial and parallel ports
- CD-ROM Drive
- 3 button mouse (optical)
- Sound card
- Headphone / microphone
- Surge protector
- Broadband Internet connection

Software

- Animation: Autodesk 3DS Max, trueSpace, etc.
- Presentation and spreadsheet: Microsoft Office (Excel, PowerPoint, Word)
- 2D graphics: CorelDraw, Adobe Illustrator/Photoshop
- Scion Image (free download)
- Video editor: Adobe Premiere Pro, etc.
- Web editor: Adobe Dreamweaver, Microsoft FrontPage, etc.
- Geospatial Information Systems (GIS) Software (e.g., ArcGIS)

Supplemental Software

- Adobe Creative Suite 3 or 4
- File Compression Software (e.g., WinZip)
- NetOp Classroom Management Software
- SnagIt Screen Capturing Software

Recommendations Per Lab

- 24 computer stations recommended (Networked)
- Scanner-flatbed
- Digital camera
- Color printer capable of graphics output
- 2 Flash drives: 1 GB minimum

- Video input device with Firewire cabling
- Data projector (1000 or better lumens) with screen OR SmartBoard
- Teacher computer station w/DVD
- One additional computer for rendering (80 GB hard drive, 4 GB RAM, Video port, DVD burner)

Supplies
- Blank CD-R or CD-RW disks
- Ink cartridges
- Replacement bulb for projector

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. **Recommended Equipment is listed above.**

Career and Technical Student Organization (CTSO)

The Florida Technology Student Association (FL-TSA) is the intercurricular career and technical student organization for providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

Cooperative Training – OJT

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

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 Occupational Completion Point (OCP) or a Modified Occupational Completion Point (MOCP). If needed, a student may enroll in the same career and technical course more than once. Documentation should be included in the IEP that clearly indicates that it is anticipated that the student may need an additional year to complete an OCP/MOCP. The student should work on different competencies and new applications of competencies each year toward completion of the OCP/MOCP. After achieving the competencies identified for the year, the student earns credit for the course. It is important to ensure that credits earned by students are reported accurately. The district's information system must be designed to accept multiple credits for the same course number for eligible students with disabilities.

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

Florida Department of Education
Curriculum Framework

Program Title: **Engineering by Design**
Program Type: **Non Career Preparatory**
Career Cluster: **Engineering & Technology Education**

NOTE: This program has been **daggered for deletion** with 2012-2013 being the last cohort of students permitted to enroll in the program. After 2012-2013, **no new students may be enrolled in this program**. Students already enrolled in the program may, at the District's discretion, continue taking courses in the program until completion. Alternative enrollment option for students is Applied Engineering Technology (8401100).

Secondary – Non Career Preparatory	
Program Number	9400200
CIP Number	0821010101
Grade Level	9-12; 30, 31
Standard Length	5 credits
Teacher Certification	TEC ED 1 @2 ENG @7 7G
CTSO	Florida Technology Student Association (FL-TSA)
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This program provides a student with a foundation in the role of technology in everyday life along with a broad range of technology skills that make them aware of technology around them. Students completing the program will become technologically literate by learning the concepts and role that engineering, design, invention, and innovation have in creating technology systems that help make life easier and better. Students learn that technology must be evaluated to determine the positive and negative effects, and how these have shaped today's global society. The key component of the program is that students become knowledgeable about technology, and use hands-on lessons to apply and transfer this knowledge to common problems.

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 the courses shown in the following table:

Course Number	Course Title	Length	Level	Graduation Requirement
8600120	Foundations of Technology	1 credit	2	VO
8600130	Impacts of Technology	1 credit	2	VO
8600140	Introduction to Design	1 credit	2	PA
8600150	Technological Issues	1 credit	2	VO
8600160	Engineering Design	1 credit	2	PA

(Graduation Requirement Abbreviations- EQ= Equally Rigorous Science, PA= Practical Arts, EC= Economics, VO= Career and Technical Education)

Academic Alignment

Academic alignment is an ongoing, collaborative effort of professional educators specializing in the fields of science, mathematics, English/language arts, and Career and Technical Education (CTE). This initiative supports CTE programs by improving student performance through the integration of academic content within CTE courses. Career and Technical Education courses that have been aligned to the Next Generation Sunshine State Standards for Science and the Florida Standards for Mathematics and English/Language Arts will show the following data: the quantity of academic standards in the CTE course; the total number of standards contained in the academic course; and the percentage of alignment to the CTE course.

Courses	Anatomy/ Physiology Honors	Astronomy Solar/Galactic Honors	Biology 1	Chemistry 1	Earth-Space Science	Environmental Science	Genetics	Integrated Science	Marine Science 1 Honors	Physical Science	Physics 1
8600120	**	**	**	**	**	**	**	**	**	**	**
8600130	**	**	**	**	**	**	**	**	**	**	**
8600140	**	**	**	**	**	**	**	**	**	**	**
8600150	**	**	**	**	**	**	**	**	**	**	**
8600160	**	**	**	**	**	**	**	**	**	**	**

** *Alignment pending review* # *Alignment attempted, but no correlation to academic course*

Courses	Algebra 1	Algebra 2	Geometry	English 1	English 2	English 3	English 4
8600120	**	**	**	**	**	**	**
8600130	**	**	**	**	**	**	**
8600140	**	**	**	**	**	**	**
8600150	**	**	**	**	**	**	**
8600160	**	**	**	**	**	**	**

** *Alignment pending review* # *Alignment attempted, but no correlation to academic course*

Florida Standards for Technical Subjects

Florida Standards (FS) for English Language Arts and Literacy in History/Social Studies, Science, and Technical Subjects are the critical reading and writing literacy standards designed for grade 6 and above. These standards are predicated on teachers of history/social studies, science, and technical subjects using their content area expertise to help students meet the particular challenges of reading, writing, speaking, listening, and language in their respective fields. It is important to note that the 6-12 literacy standards in history/social studies, science, and technical subjects are not meant to replace content standards in those areas but rather to supplement them.

This curriculum framework incorporates the grades 9-10 reading and writing literacy standards in the first two courses of this CTE program and grade 11-12 reading and writing literacy standards in the third and fourth courses of this CTE program. The standards for Mathematical Practices describe varieties of expertise that educators at all levels should seek to develop in their students. These practices rest on important "processes and proficiencies" with longstanding importance in mathematics education. This curriculum framework incorporates the appropriate mathematical practices in the first four courses of this CTE program.

Common Career Technical Core – Career Ready Practices

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

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

2. Apply appropriate academic and technical skills.

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

4. Communicate clearly, effectively and with reason.

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

6. Demonstrate creativity and innovation.

7. Employ valid and reliable research strategies.

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

9. Model integrity, ethical leadership and effective management.

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

11. Use technology to enhance productivity.

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

Standards

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

01.0 Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Engineering by Design.
02.0 Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Engineering by Design.
03.0 Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Engineering by Design.
04.0 Demonstrate an understanding of the characteristics and scope of technology.
05.0 Demonstrate an understanding of the core concepts of technology.
06.0 Demonstrate an understanding of the relationships among technologies and the connection between technology and other fields of study.
07.0 Demonstrate an understanding of the cultural, social, economic, and political effects of technology.
08.0 Demonstrate an understanding of the effects of technology on the environment.
09.0 Demonstrate an understanding of the role of society in the development and use of technology.
10.0 Demonstrate an understanding of the influence of technology on history.
11.0 Demonstrate an understanding of the attributes of design.
12.0 Demonstrate an understanding of the engineering design.
13.0 Demonstrate an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving.
14.0 Demonstrate the abilities to apply the design process.
15.0 Demonstrate the abilities to use and maintain technological products and systems.
16.0 Demonstrate the abilities to assess the impact of products and systems.
17.0 Demonstrate an understanding of and be able to select and use medical technologies.
18.0 Demonstrate an understanding of and be able to select and use agricultural and related biotechnologies.
19.0 Demonstrate an understanding of and be able to select and use energy and power technologies.
20.0 Demonstrate an understanding of and be able to select and use information and communication technologies.
21.0 Demonstrate an understanding of and be able to select and use transportation technologies.
22.0 Demonstrate an understanding of and be able to select and use manufacturing technologies.
23.0 Demonstrate an understanding of and be able to select and use construction technologies.
24.0 Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Engineering by Design.
25.0 Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Engineering by Design.
26.0 Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Engineering by Design.

Florida Department of Education
Student Performance Standards

Course Title: **Foundations of Technology**
Course Number: **8600120**
Course Credit: **1**

Course Description:
This course focuses on the three dimensions of technological literacy: knowledge, ways of thinking and acting, and capabilities with the goal of students developing the characteristics of a technologically literate citizen. It employs teaching/learning strategies that enable students to build their own understanding of new ideas. It is designed to engage students in exploring and deepening their understanding of "big ideas" regarding technology and makes use of a variety assessment instruments to reveal the extent of understanding.

Students develop an understanding of the influence of technology on history by exploring how people of all times and places have increased their capability by using their unique skills to innovate, improvise and invent. They gain an understanding of technology innovation and the fact that it often results when ideas, knowledge, or skills are shared within a technology, among technologies or across other fields of study. Students develop an understanding of engineering design, the formal process that transforms ideas into products or systems of the designed world. They will select and use manufacturing technologies and understand that modern manufacturing technologies produce quality goods at low prices, enhancing the quality of life for many people. Students will select and use construction technologies and recognize that cultural norms, environmental conditions, and the requirements of enterprises and institutions impact the design of structures. Opportunities will be provided that enable students to select and use energy and power technologies and to explore the processing and controlling of the energy resources that have been important in the development of contemporary technology. They will become familiar with information and communications technologies and their role in maintaining competitive economic growth. The course will conclude with the synthesizing of major ideas through an understanding of the core concepts of technology with an emphasis on systems-thinking and related principles.

Florida Standards			Correlation to CTE Program Standard #
01.0	Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Engineering by Design.		
	01.01 Key Ideas and Details		
	01.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. LAFS.910.RST.1.1	
	01.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.910.RST.1.2	

Florida Standards		Correlation to CTE Program Standard #
01.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.910.RST.1.3	
01.02	Craft and Structure	
01.02.1	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. LAFS.910.RST.2.4	
01.02.2	Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). LAFS.910.RST.2.5	
01.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. LAFS.910.RST.2.6	
01.03	Integration of Knowledge and Ideas	
01.03.1	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. LAFS.910.RST.3.7	
01.03.2	Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. LAFS.910.RST.3.8	
01.03.3	Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. LAFS.910.RST.3.9	
01.04	Range of Reading and Level of Text Complexity	
01.04.1	By the end of grade 9, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range.	
01.04.2	By the end of grade 10, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 9–10 text complexity band independently and proficiently. LAFS.910.RST.4.10	

Florida Standards			Correlation to CTE Program Standard #
02.0	Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Engineering by Design.		
	02.01 Text Types and Purposes		
	02.01.1	Write arguments focused on discipline-specific content. LAFS.910.WHST.1.1	
	02.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.910.WHST.1.2	
	02.02 Production and Distribution of Writing		
	02.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.910.WHST.2.4	
	02.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.910.WHST.2.5	
	02.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. LAFS.910.WHST.2.6	
	02.03 Research to Build and Present Knowledge		
	02.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.910.WHST.3.7	
	02.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. LAFS.910.WHST.3.8	
	02.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.910.WHST.3.9	
	02.04 Range of Writing		

Florida Standards		Correlation to CTE Program Standard #
02.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.910.WHST.4.10	
03.0	Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Engineering by Design.	
03.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	
03.02	Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
03.03	Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
03.04	Model with mathematics. MAFS.K12.MP.4.1	
03.05	Use appropriate tools strategically. MAFS.K12.MP.5.1	
03.06	Attend to precision. MAFS.K12.MP.6.1	
03.07	Look for and make use of structure. MAFS.K12.MP.7.1	
03.08	Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
04.0	Demonstrate an understanding of the characteristics and scope of technology. – The student will be able to:		
04.01	Discuss the nature and development of technological knowledge and processes.		
04.02	Graph the rapid increase in the rate of technological development and diffusion.		
04.03	Conduct specific goal-directed research related to inventions and innovations.		
04.04	Evaluate current technological developments that are/were driven by profit motive and the market.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
05.0	Demonstrate an understanding of the core concepts of technology. – The student will be able to:		
05.01	Assess technological systems, which are the building blocks of technology and are embedded within larger technological, social, and environmental systems.		
05.02	Assess the stability of a technological system and its influence by all of the components in the system, especially those in the feedback loop.		
05.03	Compare resources involving trade-offs between competing values, such as availability, cost, desirability, and waste.		
05.04	Discuss new technologies that create new processes.		
06.0	Demonstrate an understanding of the relationships among technologies and the connection between technology and other fields of study. – The student will be able to:		
06.01	Create technology transfer occurring when a new user applies an existing innovation developed for one purpose in a different function.		
06.02	Examine technological innovation resulting when ideas, knowledge, or skills are shared within a technology, among technologies, or across other fields.		
06.03	Report the process of patenting to protect a technological idea.		
06.04	Investigate technological progresses that promote the advancement of science and mathematics.		
09.0	Demonstrate an understanding of the role of society in the development and use of technology. – The student will be able to:		
09.01	Evaluate a number of different factors, such as advertising, the strength of the economy, the goals of a company, and the latest fads as contributors to shaping the design of and demand for various technologies.		
10.0	Demonstrate an understanding of the influence of technology on history. – The student will be able to:		
10.01	Explain how most technological development has been evolutionary, the result of a series of refinements to a basic invention.		
10.02	Debate that early in the history of technology, the development of many tools and machines was based not on scientific knowledge but on technological know-how.		
10.03	Discuss the Iron Age as the use of iron and steel as the primary materials for tools.		
10.04	Discuss the Middle Ages and its development of many technological devices that produced long-lasting effects on technology and society.		
10.05	Discuss the Renaissance, a time of rebirth of the arts and humanities, as an important development in the history of technology.		
10.06	Discuss the Industrial Revolution and the development of continuous manufacturing, sophisticated transportation and communication systems, advanced construction practices, and improved education and leisure time.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
10.07	Discuss the Information Age and its placement of emphasis on the processing and exchange of information.		
11.0	Demonstrate an understanding of the attributes of design. – The student will be able to:		
11.01	Implement the design process; including defining a problem, brainstorming, researching and generating ideas, identifying criteria and specifying constraints, exploring possibilities, selecting an approach, developing a design proposal, making a model or prototype, testing and evaluating the design using specifications, refining the design, creating or making it, and communicating processes and results.		
11.02	Translate design problems that are seldom presented in a clearly defined form.		
11.03	Evaluate a design continually, and improve and revise the idea of the design as needed.		
11.04	Analyze competing requirements of a design, such as criteria, constraints, and efficiency.		
12.0	Demonstrate an understanding of the engineering design. – The student will be able to:		
12.01	Select design principles used to evaluate existing designs, to collect data, and to guide the design process.		
12.02	Examine the influence of personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly on the Engineering Design process.		
12.03	Construct a prototype or a working model used to test a design concept by making actual observations and necessary adjustments.		
12.04	Evaluate factors taken into account in the process of engineering.		
13.0	Demonstrate an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving. – The student will be able to:		
13.01	Employ research and development as a specific problem solving approach that is used intensively in business and industry to prepare devices and systems for the marketplace.		
14.0	Demonstrate the abilities to apply the design process. – The student will be able to:		
14.01	Evaluate criteria and constraints and determine how these will affect the design process.		
14.02	Refine a design by using prototypes and modeling to ensure quality, efficiency, and productivity of the final product.		
14.03	Evaluate the design solution using conceptual, physical, and mathematical models at various intervals of the design process in order to check for proper design and to note areas where improvements are needed.		
14.04	Produce a product or system using a design process.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	14.05 Evaluate final solutions and communicate observations, processes, and results of the entire design process, using verbal, graphic, quantitative, virtual, and written means, in addition to three-dimensional models.		
15.0	Demonstrate the abilities to use and maintain technological products and systems. – The student will be able to:		
	15.01 Document processes and procedures and communicate them to different audiences using appropriate oral and written techniques.		
	15.02 Diagnose a system that is malfunctioning and use tools, materials, machines, and knowledge to repair it.		
	15.03 Troubleshoot, analyze, and maintain systems to ensure safe and proper function and precision.		
	15.04 Operate systems so that they function in the way they were designed.		
	15.05 Use computers and calculators to access, retrieve, organize, process, maintain, interpret, and evaluate data and information in order to communicate.		
16.0	Demonstrate the abilities to assess the impact of products and systems. – The student will be able to:		
	16.01 Collect information and evaluate its quality.		
17.0	Demonstrate an understanding of and be able to select and use medical technologies. – The student will be able to:		
	17.01 Discuss telemedicine and its convergence of technological advances in a number of fields, including medicine, virtual presence, computer engineering, informatics, artificial intelligence, robotics, materials science, and perceptual psychology.		
18.0	Demonstrate an understanding of and be able to select and use agricultural and related biotechnologies. – The student will be able to:		
	18.01 Discuss agriculture, including a combination of businesses that use a wide array of products and systems to produce, process, and distribute food, fiber, fuel, chemical, and other useful products.		
19.0	Demonstrate an understanding of and be able to select and use energy and power technologies. – The student will be able to:		
	19.01 Discuss how energy cannot be created nor destroyed; however, it can be converted from one form to another.		
	19.02 Categorize types of energy into major forms: thermal, radiant, electrical, mechanical, chemical, nuclear, and others.		
	19.03 Classify energy resources as renewable or nonrenewable.		
	19.04 Construct a power system having a source of energy, a process, and loads.		
20.0	Demonstrate an understanding of and be able to select and use information and communication technologies. – The student will be able to:		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
20.01	Discuss information and communication technologies including the inputs, processes, and outputs associated with sending and receiving information.		
20.02	Classify information and communication systems that allow information to be transferred as human to human, human to machine, machine to human, or machine to machine.		
20.03	Use information and communication systems to inform, persuade, entertain, control, manage, and educate.		
20.04	Identify components of a communications system, including source, encoder, transmitter, receiver, decoder, storage, retrieval, and destination.		
20.05	Communicate technological knowledge and processes using symbols, measurement, conventions, icons, graphic images, and languages that incorporate a variety of visual, auditory, and tactile stimuli.		
21.0	Demonstrate an understanding of and be able to select and use transportation technologies. – The student will be able to:		
21.01	Analyze the vital role played by transportation in the operation of other technologies, such as manufacturing, construction, communication, health and safety, and agriculture.		
22.0	Demonstrate an understanding of and be able to select and use manufacturing technologies. – The student will be able to:		
22.01	Classify materials based on their qualities as natural, synthetic, or mixed.		
22.02	Identify and classify manufacturing systems into types, such as customized production, batch production, and continuous production.		
22.03	Discuss the interchangeability of parts to increase the effectiveness of manufacturing processes.		
23.0	Demonstrate an understanding of and be able to select and use construction technologies. – The student will be able to:		
23.01	Define infrastructure as the underlying base or basic framework of a system.		
23.02	Identify a variety of processes and procedures used in constructing structures.		

Florida Department of Education
Student Performance Standards

Course Title: **Impacts of Technology**
Course Number: **8600130**
Course Credit: **1**

Course Description:
Students in *Impacts of Technology* learn that *technology* is a neutral topic that can have good or bad impacts on society. This *technology assessment* is a structured evaluation of the application of technology in an effort to avoid inappropriate or unwanted effects. Applying design and student imagination without considering the possible effects of new products or processes can lead to technological disasters, superfund sites, and unsafe products that could have been avoided in the initial design stages. Whether a new product, system, or process has an overall positive, neutral, or negative impact depends on the proper understanding of technology assessment. This aspect of Impacts of Technology gives students a head start on the road to technological literacy, by focusing primarily on *technology assessment* and the impact on *technology design.*

Florida Standards			Correlation to CTE Program Standard #
01.0	Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Engineering by Design.		
	01.01 Key Ideas and Details		
	01.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. LAFS.910.RST.1.1	
	01.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.910.RST.1.2	
	01.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.910.RST.1.3	
	01.02 Craft and Structure		
	01.02.1	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. LAFS.910.RST.2.4	
	01.02.2	Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). LAFS.910.RST.2.5	

Florida Standards			Correlation to CTE Program Standard #
	01.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. LAFS.910.RST.2.6	
01.03	Integration of Knowledge and Ideas		
	01.03.1	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. LAFS.910.RST.3.7	
	01.03.2	Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. LAFS.910.RST.3.8	
	01.03.3	Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. LAFS.910.RST.3.9	
01.04	Range of Reading and Level of Text Complexity		
	01.04.1	By the end of grade 9, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	01.04.2	By the end of grade 10, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 9–10 text complexity band independently and proficiently. LAFS.910.RST.4.10	
02.0	Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Engineering by Design.		
02.01	Text Types and Purposes		
	02.01.1	Write arguments focused on discipline-specific content. LAFS.910.WHST.1.1	
	02.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.910.WHST.1.2	
02.02	Production and Distribution of Writing		

Florida Standards			Correlation to CTE Program Standard #
	02.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.910.WHST.2.4	
	02.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.910.WHST.2.5	
	02.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. LAFS.910.WHST.2.6	
02.03	Research to Build and Present Knowledge		
	02.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.910.WHST.3.7	
	02.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. LAFS.910.WHST.3.8	
	02.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.910.WHST.3.9	
02.04	Range of Writing		
	02.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.910.WHST.4.10	
03.0	Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Engineering by Design.		
03.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1		
03.02	Reason abstractly and quantitatively. MAFS.K12.MP.2.1		

Florida Standards	Correlation to CTE Program Standard #
03.03 Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
03.04 Model with mathematics. MAFS.K12.MP.4.1	
03.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
03.06 Attend to precision. MAFS.K12.MP.6.1	
03.07 Look for and make use of structure. MAFS.K12.MP.7.1	
03.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
04.0	Demonstrate an understanding of the characteristics and scope of technology. – The student will be able to:		
04.01	Discuss the nature and development of technological knowledge and processes.		
04.02	Graph the rapid increase in the rate of technological development and diffusion.		
04.03	Conduct specific goal-directed research related to inventions and innovations.		
06.0	Demonstrate an understanding of the relationships among technologies and the connection between technology and other fields of study. – The student will be able to:		
06.01	Create technology transfer occurring when a new user applies an existing innovation developed for one purpose in a different function.		
06.02	Investigate technological progresses that promote the advancement of science and mathematics.		
07.0	Demonstrate an understanding of the cultural, social, economic, and political effects of technology. – The student will be able to:		
07.01	Discuss changes caused by the use of technology ranging from gradual to rapid and from subtle to obvious.		
07.02	Evaluate the use of technology involving weighing the trade-offs between the positive and the negative effects.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	07.03 Discuss ethical considerations important in the development, selection, and use of technologies.		
	07.04 Debate the cultural, social, economic, and political changes caused by the transfer of a technology from one society to another.		
08.0	Demonstrate an understanding of the effects of technology on the environment. – The student will be able to:		
	08.01 Consider trade-offs of developing technologies to reduce the use of resources.		
	08.02 Use technology to monitor the environment and provide information as a basis for decision-making.		
	08.03 Compare and contrast the alignment of technological processes with natural processes to maximize performance and reduce negative impacts on the environment.		
	08.04 Assess technologies devised to reduce the negative consequences of other technologies.		
	08.05 Make decisions about the implementation of technologies involving the weighing of trade-offs between predicted positive and negative effects on the environment.		
09.0	Demonstrate an understanding of the role of society in the development and use of technology. – The student will be able to:		
	09.01 Report how different cultures develop their own technologies to satisfy their individual and shared needs, wants, and values.		
	09.02 Consider societal opinions and demands, as well as corporate cultures to use as a basis for deciding whether or not to develop a technology.		
	09.03 Evaluate a number of different factors, such as advertising, the strength of the economy, the goals of a company, and the latest fads as contributors to shaping the design of and demand for various technologies.		
10.0	Demonstrate an understanding of the influence of technology on history. – The student will be able to:		
	10.01 Assess how the evolution of civilization has been directly affected by, and has in turn affected, the development and use of tools and materials.		
	10.02 Research the history of technology as a powerful force in reshaping the social, cultural, political, and economic landscape.		
	10.03 Discuss the Iron Age as the use of iron and steel as the primary materials for tools.		
	10.04 Discuss the Middle Ages and its development of many technological devices that produced long-lasting effects on technology and society.		
	10.05 Discuss the Renaissance, a time of rebirth of the arts and humanities, as an important development in the history of technology.		
	10.06 Discuss the Industrial Revolution and the development of continuous manufacturing, sophisticated transportation and communication systems, advanced construction practices, and improved education and leisure time.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	10.07 Discuss the Information Age and its placement of emphasis on the processing and exchange of information.		
13.0	Demonstrate an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving. – The student will be able to:		
	13.01 Conduct research needed to solve technological problems.		
	13.02 Differentiate between technological and non-technological problems, and identify which problems can be solved using technology.		
14.0	Demonstrate the abilities to apply the design process. – The student will be able to:		
	14.01 Interpret the design problem to solve and decide whether or not to address it.		
16.0	Demonstrate the abilities to assess the impact of products and systems. – The student will be able to:		
	16.01 Collect information and evaluate its quality.		
	16.02 Synthesize data, analyze trends, and draw conclusions regarding the effect of technology on the individual, society, and the environment.		
	16.03 Apply assessment techniques, such as trend analysis and experimentation to make decisions about the future development of technology.		
	16.04 Design forecasting techniques to evaluate the results of altering natural systems.		
17.0	Demonstrate an understanding of and be able to select and use medical technologies. – The student will be able to:		
	14.01 Classify medical technologies including prevention and rehabilitation, vaccines and pharmaceuticals, medical and surgical procedures, genetic engineering, and the systems within which health is protected and maintained.		
18.0	Demonstrate an understanding of and be able to select and use agricultural and related biotechnologies. – The student will be able to:		
	15.01 Identify biotechnology applications in such areas as agriculture, pharmaceuticals, food and beverages, medicine, energy, the environment, and genetic engineering.		
19.0	Demonstrate an understanding of and be able to select and use energy and power technologies. – The student will be able to:		
	16.01 Explain impossibility of building an engine to perform work that does not exhaust thermal energy to the surroundings.		
	16.02 Classify energy resources as renewable or nonrenewable.		
20.0	Demonstrate an understanding of and be able to select and use information and communication technologies. – The student will be able to:		
	17.01 Use information and communication systems to inform, persuade, entertain, control, manage, and educate.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	17.02 Identify many ways to communicate information, such as graphic and electronic means.		
21.0	Demonstrate an understanding of and be able to select and use transportation technologies. – The student will be able to:		
	18.01 Define intermodalism as the use of different modes of transportation, such as highways, railways, and waterways as part of an interconnected system that can move people and goods easily from one mode to another.		
	18.02 Discuss how transportation services and methods have led to a population that is regularly on the move.		
22.0	Demonstrate an understanding of and be able to select and use manufacturing technologies. – The student will be able to:		
	19.01 Service products to keep them in good operating condition.		
	19.02 Classify materials based on their qualities as natural, synthetic, or mixed.		
	19.03 Identify chemical technologies providing a means for humans to alter or modify materials and to produce chemical products.		
	19.04 Employ marketing techniques involving establishing a product's identity, conducting research on its potential, advertising it, distributing it, and selling it.		
23.0	Demonstrate an understanding of and be able to select and use construction technologies. – The student will be able to:		
	20.01 Recommend maintenance, alterations, or renovations to improve a structure or alter its intended use.		

Florida Department of Education
Student Performance Standards

Course Title: **Introduction to Design**
Course Number: **8600140**
Course Credit: **1**

Course Description:
This course provides students with a framework for problem-solving using a technological design process.

Florida Standards			Correlation to CTE Program Standard #
24.0	Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Engineering by Design.		
	24.01 Key Ideas and Details		
	24.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. LAFS.1112.RST.1.1	
	24.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.1112.RST.1.2	
	24.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.1112.RST.1.3	
	24.02 Craft and Structure		
	24.02.1	Determine the meaning of symbols key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. LAFS.1112.RST.2.4	
	24.02.2	Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. LAFS.1112.RST.2.5	
	24.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. LAFS.1112.RST.2.6	

Florida Standards			Correlation to CTE Program Standard #
24.03	Integration of Knowledge and Ideas		
	24.03.1	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g. quantitative data, video, multimedia) in order to address a question or solve a problem. LAFS.1112.RST.3.7	
	24.03.2	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. LAFS.1112.RST.3.8	
	24.03.3	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. LAFS.1112.RST.3.9	
24.04	Range of Reading and Level of Text Complexity		
	24.04.1	By the end of grade 11, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	24.04.2	By the end of grade 12, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 11–CCR text complexity band independently and proficiently. LAFS.1112.RST.4.10	
25.0	Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Engineering by Design.		
25.01	Text Types and Purposes		
	25.01.1	Write arguments focused on discipline-specific content. LAFS.1112.WHST.1.1	
	25.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.1112.WHST.1.2	
25.02	Production and Distribution of Writing		
	25.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.1112.WHST.2.4	

Florida Standards			Correlation to CTE Program Standard #
	25.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.1112.WHST.2.5	
	25.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. LAFS.1112.WHST.2.6	
	25.03	Research to Build and Present Knowledge	
	25.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.1112.WHST.3.7	
	25.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. LAFS.1112.WHST.3.8	
	25.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.1112.WHST.3.9	
	25.04	Range of Writing	
	25.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.1112.WHST.4.10	
26.0	Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Engineering by Design.		
	26.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	
	26.02	Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
	26.03	Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	

Florida Standards	Correlation to CTE Program Standard #
26.04 Model with mathematics. MAFS.K12.MP.4.1	
26.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
26.06 Attend to precision. MAFS.K12.MP.6.1	
26.07 Look for and make use of structure. MAFS.K12.MP.7.1	
26.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
04.0 Demonstrate an understanding of the characteristics and scope of technology. – The student will be able to:		
04.01 Discuss the nature and development of technological knowledge and processes.		
04.02 Graph the rapid increase in the rate of technological development and diffusion.		
04.03 Conduct specific goal-directed research related to inventions and innovations.		
04.04 Evaluate current technological developments that are/were driven by profit motive and the market.		
05.0 Demonstrate an understanding of the core concepts of technology. – The student will be able to:		
05.01 Apply systems thinking logic and creativity with appropriate compromises in complex real-life problems.		
05.02 Assess technological systems, which are the building blocks of technology and are embedded within larger technological, social, and environmental systems.		
05.03 Assess the stability of a technological system and its influence by all of the components in the system, especially those in the feedback loop.		
05.04 Compare resources involving trade-offs between competing values, such as availability, cost, desirability, and waste.		
05.05 Identify the criteria and constraints of a product or system and then determine how they affect the final design and development.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
05.06	Propose strategies for optimizing a technological process or methodology of designing or making a product, dependent on criteria and constraints.		
05.07	Discuss new technologies that create new processes.		
05.08	Recommend a quality control process to ensure that a product, service or system meets established criteria.		
05.09	Organize a management system as the process of planning, organizing, and controlling work.		
05.10	Outline complex systems that have many layers of controls and feedback loops to provide information.		
06.0	Demonstrate an understanding of the relationships among technologies and the connection between technology and other fields of study. – The student will be able to:		
06.01	Create technology transfer occurring when a new user applies an existing innovation developed for one purpose in a different function.		
06.02	Examine technological innovation resulting when ideas, knowledge, or skills are shared within a technology, among technologies, or across other fields.		
06.03	Report the process of patenting to protect a technological idea.		
06.04	Investigate technological progresses that promote the advancement of science and mathematics.		
07.0	Demonstrate an understanding of the cultural, social, economic, and political effects of technology. – The student will be able to:		
07.01	Discuss changes caused by the use of technology ranging from gradual to rapid and from subtle to obvious.		
07.02	Evaluate the use of technology involving weighing the trade-offs between the positive and the negative effects.		
07.03	Discuss ethical considerations important in the development, selection, and use of technologies.		
07.04	Debate the cultural, social, economic, and political changes caused by the transfer of a technology from one society to another.		
08.0	Demonstrate an understanding of the effects of technology on the environment. – The student will be able to:		
08.01	Devise technologies to conserve water, soil, and energy through such techniques as reusing, reducing and recycling.		
08.02	Consider trade-offs of developing technologies to reduce the use of resources.		
08.03	Use technology to monitor the environment and provide information as a basis for decision-making.		
08.04	Compare and contrast the alignment of technological processes with natural processes to maximize performance and reduce negative impacts on the environment.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
08.05	Assess technologies devised to reduce the negative consequences of other technologies.		
08.06	Make decisions about the implementation of technologies involving the weighing of trade-offs between predicted positive and negative effects on the environment.		
09.0	Demonstrate an understanding of the role of society in the development and use of technology. – The student will be able to:		
09.01	Report how different cultures develop their own technologies to satisfy their individual and shared needs, wants, and values.		
09.02	Consider societal opinions and demands, as well as corporate cultures to use as a basis for deciding whether or not to develop a technology.		
09.03	Evaluate a number of different factors, such as advertising, the strength of the economy, the goals of a company, and the latest fads as contributors to shaping the design of and demand for various technologies.		
10.0	Demonstrate an understanding of the influence of technology on history. – The student will be able to:		
10.01	Assess how the evolution of civilization has been directly affected by, and has in turn affected, the development and use of tools and materials.		
10.02	Research the history of technology as a powerful force in reshaping the social, cultural, political, and economic landscape.		
10.03	Debate that early in the history of technology, the development of many tools and machines was based not on scientific knowledge but on technological know-how.		
10.04	Discuss the Iron Age as the use of iron and steel as the primary materials for tools.		
10.05	Discuss the Middle Ages and its development of many technological devices that produced long-lasting effects on technology and society.		
10.06	Discuss the Renaissance, a time of rebirth of the arts and humanities, as an important development in the history of technology.		
10.07	Discuss the Industrial Revolution and the development of continuous manufacturing, sophisticated transportation and communication systems, advanced construction practices, and improved education and leisure time.		
10.08	Discuss the Information Age and its placement of emphasis on the processing and exchange of information.		
11.0	Demonstrate an understanding of the attributes of design. – The student will be able to:		
11.01	Implement the design process; including defining a problem, brainstorming, researching and generating ideas, identifying criteria and specifying constraints, exploring possibilities, selecting an approach, developing a design proposal, making a model or prototype, testing and evaluating the design using specifications, refining the design, creating or making it, and communicating processes and results.		
11.02	Translate design problems that are seldom presented in a clearly defined form.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
11.03	Evaluate a design continually, and improve and revise the idea of the design as needed.		
11.04	Analyze competing requirements of a design, such as criteria, constraints, and efficiency.		
12.0	Demonstrate an understanding of the engineering design. – The student will be able to:		
12.01	Select design principles used to evaluate existing designs, to collect data, and to guide the design process.		
12.02	Examine the influence of personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly on the Engineering Design process.		
12.03	Construct a prototype or a working model used to test a design concept by making actual observations and necessary adjustments.		
12.04	Evaluate factors taken into account in the process of engineering.		
13.0	Demonstrate an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving. – The student will be able to:		
13.01	Employ research and development as a specific problem solving approach that is used intensively in business and industry to prepare devices and systems for the marketplace.		
13.02	Conduct research needed to solve technological problems.		
13.03	Differentiate between technological and non-technological problems, and identify which problems can be solved using technology.		
13.04	Utilize a multidisciplinary approach to solving technological problems.		
14.0	Demonstrate the abilities to apply the design process. – The student will be able to:		
14.01	Interpret the design problem to solve and decide whether or not to address it.		
14.02	Evaluate criteria and constraints and determine how these will affect the design process.		
14.03	Refine a design by using prototypes and modeling to ensure quality, efficiency, and productivity of the final product.		
14.04	Evaluate the design solution using conceptual, physical, and mathematical models at various intervals of the design process in order to check for proper design and to note areas where improvements are needed.		
14.05	Produce a product or system using a design process.		
14.06	Evaluate final solutions and communicate observations, processes, and results of the entire design process, using verbal, graphic, quantitative, virtual, and written means, in addition to three-dimensional models.		
15.0	Demonstrate the abilities to use and maintain technological products and systems. – The student will be able to:		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
15.01	Document processes and procedures and communicate them to different audiences using appropriate oral and written techniques.		
15.02	Diagnose a system that is malfunctioning and use tools, materials, machines, and knowledge to repair it.		
15.03	Troubleshoot, analyze, and maintain systems to ensure safe and proper function and precision.		
15.04	Operate systems so that they function in the way they were designed.		
15.05	Use computers and calculators to access, retrieve, organize, process, maintain, interpret, and evaluate data and information in order to communicate.		
16.0	Demonstrate the abilities to assess the impact of products and systems. – The student will be able to:		
16.01	Collect information and evaluate its quality.		
16.02	Synthesize data, analyze trends, and draw conclusions regarding the effect of technology on the individual, society, and the environment.		
16.03	Apply assessment techniques, such as trend analysis and experimentation to make decisions about the future development of technology.		
16.04	Design forecasting techniques to evaluate the results of altering natural systems.		
17.0	Demonstrate an understanding of and be able to select and use medical technologies. – The student will be able to:		
17.01	Classify medical technologies including prevention and rehabilitation, vaccines and pharmaceuticals, medical and surgical procedures, genetic engineering, and the systems within which health is protected and maintained.		
17.02	Discuss telemedicine and its convergence of technological advances in a number of fields, including medicine, virtual presence, computer engineering, informatics, artificial intelligence, robotics, materials science, and perceptual psychology.		
17.03	Explain how the sciences of biochemistry and molecular biology have made it possible to manipulate the genetic information found in living creatures.		
18.0	Demonstrate an understanding of and be able to select and use agricultural and related biotechnologies. – The student will be able to:		
18.01	Discuss agriculture, including a combination of businesses that use a wide array of products and systems to produce, process, and distribute food, fiber, fuel, chemical, and other useful products.		
18.02	Identify biotechnology applications in such areas as agriculture, pharmaceuticals, food and beverages, medicine, energy, the environment, and genetic engineering.		
18.03	Define conservation as the process of controlling soil erosion, reducing sediment in waterways, and improving water quality.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	18.04 Apply engineering design processes to management of agricultural systems requiring knowledge of artificial ecosystems and the effects of technological development on flora and fauna.		
19.0	Demonstrate an understanding of and be able to select and use energy and power technologies. – The student will be able to:		
	19.01 Discuss how energy cannot be created nor destroyed; however, it can be converted from one form to another.		
	19.02 Categorize types of energy into major forms: thermal, radiant, electrical, mechanical, chemical, nuclear, and others.		
	19.03 Explain impossibility of building an engine to perform work that does not exhaust thermal energy to the surroundings.		
	19.04 Classify energy resources as renewable or nonrenewable.		
	19.05 Construct a power system having a source of energy, a process, and loads.		
20.0	Demonstrate an understanding of and be able to select and use information and communication technologies. – The student will be able to:		
	20.01 Discuss information and communication technologies including the inputs, processes, and outputs associated with sending and receiving information.		
	20.02 Classify information and communication systems that allow information to be transferred as human to human, human to machine, machine to human, or machine to machine.		
	20.03 Use information and communication systems to inform, persuade, entertain, control, manage, and educate.		
	20.04 Identify components of a communications system, including source, encoder, transmitter, receiver, decoder, storage, retrieval, and destination.		
	20.05 Identify many ways to communicate information, such as graphic and electronic means.		
	20.06 Communicate technological knowledge and processes using symbols, measurement, conventions, icons, graphic images, and languages that incorporate a variety of visual, auditory, and tactile stimuli.		
21.0	Demonstrate an understanding of and be able to select and use transportation technologies. – The student will be able to:		
	21.01 Analyze the vital role played by transportation in the operation of other technologies, such as manufacturing, construction, communication, health and safety, and agriculture.		
	21.02 Define intermodalism as the use of different modes of transportation, such as highways, railways, and waterways as part of an interconnected system that can move people and goods easily from one mode to another.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	21.03 Discuss how transportation services and methods have led to a population that is regularly on the move.		
	21.04 Identify processes and innovative techniques involved in the design of intelligent and non-intelligent transportation systems.		
22.0	Demonstrate an understanding of and be able to select and use manufacturing technologies. – The student will be able to:		
	22.01 Service products to keep them in good operating condition.		
	22.02 Classify materials based on their qualities as natural, synthetic, or mixed.		
	22.03 Classify goods as durable goods designed to operate for a long period of time, or non-durable goods designed to operate for a short period of time.		
	22.04 Identify and classify manufacturing systems into types, such as customized production, batch production, and continuous production.		
	22.05 Discuss the interchangeability of parts to increase the effectiveness of manufacturing processes.		
	22.06 Identify chemical technologies providing a means for humans to alter or modify materials and to produce chemical products.		
	22.07 Employ marketing techniques involving establishing a product's identity, conducting research on its potential, advertising it, distributing it, and selling it.		
23.0	Demonstrate an understanding of and be able to select and use construction technologies. – The student will be able to:		
	23.01 Define infrastructure as the underlying base or basic framework of a system.		
	23.02 Identify a variety of processes and procedures used in constructing structures.		
	23.03 Identify requirements involved in the design of structures.		
	23.04 Recommend maintenance, alterations, or renovations to improve a structure or alter its intended use.		
	23.05 Identify prefabricated materials used in some structures.		

Florida Department of Education
Student Performance Standards

Course Title: **Technological Issues**
Course Number: **8600150**
Course Credit: **1**

Course Description:
In *Technological Issues,* students learn that technology allows us to extend our ability to modify or change the natural world to meet our wants and needs. However, the resulting changes can be complicated and unpredictable. Solutions to a particular problem may cause other types of problems. Each potential technological solution creates certain issues, such as benefits, costs, risks and limitations. Not all impacts of technology are predictable or show up right away. However, the key issues of a technology should be studied and debated prior to the technology being introduced or eliminated. Alternatives should be explored, scientific and mathematical dimensions should be integrated into the decision.

Technological issues are not solely technical in nature. Attitudes towards technology can be influenced by social, cultural, economic, political, and ecological concerns. The decision to introduce or eliminate a technology will affect different people, and vary depending on the timing. Issues can create some heated debates, which require that both sides of the debate to acquire detailed information and ask the right questions.

Students learn that by studying technological issues, there may not be a solution that everyone agrees upon, nor everyone benefits or receives the cost in the same way. The study of technological issues will not give students the correct answers, but allows them to develop skills in asking critical questions, understanding alternative viewpoints and their origins, and give them the confidence to be involved in deciding which technologies to develop, which to use, and how to use them.

Florida Standards			Correlation to CTE Program Standard #
24.0	Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Engineering by Design.		
	24.01 Key Ideas and Details		
	24.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. LAFS.1112.RST.1.1	
	24.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.1112.RST.1.2	
	24.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.1112.RST.1.3	

Florida Standards			Correlation to CTE Program Standard #
24.02	Craft and Structure		
	24.02.1	Determine the meaning of symbols key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. LAFS.1112.RST.2.4	
	24.02.2	Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. LAFS.1112.RST.2.5	
	24.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. LAFS.1112.RST.2.6	
24.03	Integration of Knowledge and Ideas		
	24.03.1	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g. quantitative data, video, multimedia) in order to address a question or solve a problem. LAFS.1112.RST.3.7	
	24.03.2	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. LAFS.1112.RST.3.8	
	24.03.3	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. LAFS.1112.RST.3.9	
24.04	Range of Reading and Level of Text Complexity		
	24.04.1	By the end of grade 11, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	24.04.2	By the end of grade 12, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 11–CCR text complexity band independently and proficiently. LAFS.1112.RST.4.10	
25.0	Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Engineering by Design.		

Florida Standards			Correlation to CTE Program Standard #
25.01	Text Types and Purposes		
	25.01.1	Write arguments focused on discipline-specific content. LAFS.1112.WHST.1.1	
	25.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.1112.WHST.1.2	
25.02	Production and Distribution of Writing		
	25.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.1112.WHST.2.4	
	25.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.1112.WHST.2.5	
	25.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. LAFS.1112.WHST.2.6	
25.03	Research to Build and Present Knowledge		
	25.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.1112.WHST.3.7	
	25.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. LAFS.1112.WHST.3.8	
	25.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.1112.WHST.3.9	
25.04	Range of Writing		

Florida Standards		Correlation to CTE Program Standard #
25.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.1112.WHST.4.10	
26.0	Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Engineering by Design.	
26.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	
26.02	Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
26.03	Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
26.04	Model with mathematics. MAFS.K12.MP.4.1	
26.05	Use appropriate tools strategically. MAFS.K12.MP.5.1	
26.06	Attend to precision. MAFS.K12.MP.6.1	
26.07	Look for and make use of structure. MAFS.K12.MP.7.1	
26.08	Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
04.0	Demonstrate an understanding of the characteristics and scope of technology. – The student will be able to:		
04.01	Discuss the nature and development of technological knowledge and processes.		
04.02	Graph the rapid increase in the rate of technological development and diffusion.		
04.03	Conduct specific goal-directed research related to inventions and innovations.		
04.04	Evaluate current technological developments that are/were driven by profit motive and the market.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
06.0	Demonstrate an understanding of the relationships among technologies and the connection between technology and other fields of study. – The student will be able to:		
06.01	Report the process of patenting to protect a technological idea.		
06.02	Investigate technological progresses that promote the advancement of science and mathematics.		
07.0	Demonstrate an understanding of the cultural, social, economic, and political effects of technology. – The student will be able to:		
07.01	Evaluate the use of technology involving weighing the trade-offs between the positive and the negative effects.		
07.02	Discuss ethical considerations important in the development, selection, and use of technologies.		
07.03	Debate the cultural, social, economic, and political changes caused by the transfer of a technology from one society to another.		
08.0	Demonstrate an understanding of the effects of technology on the environment. – The student will be able to:		
08.01	Devise technologies to conserve water, soil, and energy through such techniques as reusing, reducing and recycling.		
08.02	Make decisions about the implementation of technologies involving the weighing of trade-offs between predicted positive and negative effects on the environment.		
10.0	Demonstrate an understanding of the influence of technology on history. – The student will be able to:		
10.01	Assess how the evolution of civilization has been directly affected by, and has in turn affected, the development and use of tools and materials.		
10.02	Research the history of technology as a powerful force in reshaping the social, cultural, political, and economic landscape.		
10.03	Discuss the Information Age and its placement of emphasis on the processing and exchange of information.		
13.0	Demonstrate an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving. – The student will be able to:		
13.01	Conduct research needed to solve technological problems.		
13.02	Differentiate between technological and non-technological problems, and identify which problems can be solved using technology.		
13.03	Utilize a multidisciplinary approach to solving technological problems.		
14.0	Demonstrate the abilities to apply the design process. – The student will be able to:		
14.01	Interpret the design problem to solve and decide whether or not to address it.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
16.0	Demonstrate the abilities to assess the impact of products and systems. – The student will be able to:		
16.01	Collect information and evaluate its quality.		
16.02	Synthesize data, analyze trends, and draw conclusions regarding the effect of technology on the individual, society, and the environment.		
16.03	Apply assessment techniques, such as trend analysis and experimentation to make decisions about the future development of technology.		
16.04	Design forecasting techniques to evaluate the results of altering natural systems.		
17.0	Demonstrate an understanding of and be able to select and use medical technologies. – The student will be able to:		
17.01	Explain how the sciences of biochemistry and molecular biology have made it possible to manipulate the genetic information found in living creatures.		
18.0	Demonstrate an understanding of and be able to select and use agricultural and related biotechnologies. – The student will be able to:		
18.01	Identify biotechnology applications in such areas as agriculture, pharmaceuticals, food and beverages, medicine, energy, the environment, and genetic engineering.		
18.02	Define conservation as the process of controlling soil erosion, reducing sediment in waterways, and improving water quality.		
19.0	Demonstrate an understanding of and be able to select and use energy and power technologies. – The student will be able to:		
19.01	Classify energy resources as renewable or nonrenewable.		
20.0	Demonstrate an understanding of and be able to select and use information and communication technologies. – The student will be able to:		
20.01	Use information and communication systems to inform, persuade, entertain, control, manage, and educate.		
20.02	Identify many ways to communicate information, such as graphic and electronic means.		
22.0	Demonstrate an understanding of and be able to select and use manufacturing technologies. – The student will be able to:		
22.01	Employ marketing techniques involving establishing a product's identity, conducting research on its potential, advertising it, distributing it, and selling it.		

Florida Department of Education
Student Performance Standards

Course Title: **Engineering Design**
Course Number: **8600160**
Course Credit: **1**

Course Description:
Engineering Design contributes to the development of each high school student's capacity to make responsible judgments about technology's development, control, and use. Critiquing appropriate technology and sustainable development are important. The structure of the course brings discussions of technological values so that students can reflect and develop their own ethical standards. Students are actively involved in the organized and integrated application of technological resources, engineering concepts, and scientific procedures.

Through high school technology education experiences, students address the complexities of technology and issues that stem from designing, developing, using, and assessing technological systems. In developing a functional understanding of technology, students comprehend how human conditions, current affairs, and personal preferences drive technological design and problem solving. Actively engaged in making and developing, using, and managing technological systems, students better understand the role of systems in meeting specific purposes. Students are able to analyze and understand the behavior and operation of basic technological systems in different contexts. Students are able to extend their knowledge of systems to new and emerging applications by the time they graduate from high school.

As the capstone experience for the *Engineering By Design Program*, Engineering Design provides students with the knowledge and skills to delve deeper into Engineering at the post-secondary level.

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
04.0	Demonstrate an understanding of the characteristics and scope of technology. – The student will be able to:		
04.01	Discuss the nature and development of technological knowledge and processes.		
04.02	Conduct specific goal-directed research related to inventions and innovations.		
04.03	Evaluate current technological developments that are/were driven by profit motive and the market.		
05.0	Demonstrate an understanding of the core concepts of technology. – The student will be able to:		
05.01	Apply systems thinking logic and creativity with appropriate compromises in complex real-life problems.		
05.02	Assess the stability of a technological system and its influence by all of the components in the system, especially those in the feedback loop.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
05.03	Compare resources involving trade-offs between competing values, such as availability, cost, desirability, and waste.		
05.04	Identify the criteria and constraints of a product or system and then determine how they affect the final design and development.		
05.05	Propose strategies for optimizing a technological process or methodology of designing or making a product, dependent on criteria and constraints.		
05.06	Discuss new technologies that create new processes.		
05.07	Recommend a quality control process to ensure that a product, service or system meets established criteria.		
05.08	Organize a management system as the process of planning, organizing, and controlling work.		
05.09	Outline complex systems that have many layers of controls and feedback loops to provide information.		
06.0	Demonstrate an understanding of the relationships among technologies and the connection between technology and other fields of study. – The student will be able to:		
06.01	Create technology transfer occurring when a new user applies an existing innovation developed for one purpose in a different function.		
06.02	Examine technological innovation resulting when ideas, knowledge, or skills are shared within a technology, among technologies, or across other fields.		
06.03	Report the process of patenting to protect a technological idea.		
07.0	Demonstrate an understanding of the cultural, social, economic, and political effects of technology. – The student will be able to:		
07.01	Discuss ethical considerations important in the development, selection, and use of technologies.		
08.0	Demonstrate an understanding of the effects of technology on the environment. – The student will be able to:		
08.01	Devise technologies to conserve water, soil, and energy through such techniques as reusing, reducing and recycling.		
08.02	Consider trade-offs of developing technologies to reduce the use of resources.		
08.03	Assess technologies devised to reduce the negative consequences of other technologies.		
09.0	Demonstrate an understanding of the role of society in the development and use of technology. – The student will be able to:		
09.01	Consider societal opinions and demands, as well as corporate cultures to use as a basis for deciding whether or not to develop a technology.		
11.0	Demonstrate an understanding of the attributes of design. – The student will be able to:		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
11.01	Implement the design process; including defining a problem, brainstorming, researching and generating ideas, identifying criteria and specifying constraints, exploring possibilities, selecting an approach, developing a design proposal, making a model or prototype, testing and evaluating the design using specifications, refining the design, creating or making it, and communicating processes and results.		
11.02	Translate design problems that are seldom presented in a clearly defined form.		
11.03	Evaluate a design continually, and improve and revise the idea of the design as needed.		
11.04	Analyze competing requirements of a design, such as criteria, constraints, and efficiency.		
12.0	Demonstrate an understanding of the engineering design. – The student will be able to:		
12.01	Select design principles used to evaluate existing designs, to collect data, and to guide the design process.		
12.02	Examine the influence of personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly on the Engineering Design process.		
12.03	Construct a prototype or a working model used to test a design concept by making actual observations and necessary adjustments.		
12.04	Evaluate factors taken into account in the process of engineering.		
13.0	Demonstrate an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving. – The student will be able to:		
13.01	Employ research and development as a specific problem solving approach that is used intensively in business and industry to prepare devices and systems for the marketplace.		
14.0	Demonstrate the abilities to apply the design process. – The student will be able to:		
14.01	Evaluate criteria and constraints and determine how these will affect the design process.		
14.02	Refine a design by using prototypes and modeling to ensure quality, efficiency, and productivity of the final product.		
14.03	Evaluate the design solution using conceptual, physical, and mathematical models at various intervals of the design process in order to check for proper design and to note areas where improvements are needed.		
14.04	Produce a product or system using a design process.		
14.05	Evaluate final solutions and communicate observations, processes, and results of the entire design process, using verbal, graphic, quantitative, virtual, and written means, in addition to three-dimensional models.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
18.0	Demonstrate an understanding of and be able to select and use agricultural and related biotechnologies. – The student will be able to:		
18.01	Apply engineering design processes to management of agricultural systems requiring knowledge of artificial ecosystems and the effects of technological development on flora and fauna.		
19.0	Demonstrate an understanding of and be able to select and use energy and power technologies. – The student will be able to:		
19.01	Discuss how energy cannot be created nor destroyed; however, it can be converted from one form to another.		
19.02	Categorize types of energy into major forms: thermal, radiant, electrical, mechanical, chemical, nuclear, and others.		
19.03	Explain impossibility of building an engine to perform work that does not exhaust thermal energy to the surroundings.		
19.04	Classify energy resources as renewable or nonrenewable.		
19.05	Construct a power system having a source of energy, a process, and loads.		
20.0	Demonstrate an understanding of and be able to select and use information and communication technologies. – The student will be able to:		
20.01	Identify many ways to communicate information, such as graphic and electronic means.		
20.02	Communicate technological knowledge and processes using symbols, measurement, conventions, icons, graphic images, and languages that incorporate a variety of visual, auditory, and tactile stimuli.		
21.0	Demonstrate an understanding of and be able to select and use transportation technologies. – The student will be able to:		
21.01	Identify processes and innovative techniques involved in the design of intelligent and non-intelligent transportation systems.		
22.0	Demonstrate an understanding of and be able to select and use manufacturing technologies. – The student will be able to:		
22.01	Classify materials based on their qualities as natural, synthetic, or mixed.		
22.02	Classify goods as durable goods designed to operate for a long period of time, or non-durable goods designed to operate for a short period of time.		
22.03	Identify and classify manufacturing systems into types, such as customized production, batch production, and continuous production.		
22.04	Discuss the interchangeability of parts to increase the effectiveness of manufacturing processes.		
23.0	Demonstrate an understanding of and be able to select and use construction technologies. – The student will be able to:		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
23.01 Identify requirements involved in the design of structures.		
23.02 Recommend maintenance, alterations, or renovations to improve a structure or alter its intended use.		
23.03 Identify prefabricated materials used in some structures.		

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.

Special Notes

CATTS Curriculum
Curriculum materials for teaching this program are available at no charge. For access to the materials, contact the State Supervisor for Engineering and Technology Education. More information about this program is available online at http://www.iteaconnect.org/EbD/ebd.htm, including access to the EbD Network, and training and resource portal specifically for the program.

Career and Technical Student Organization (CTSO)

The Florida Technology Student Association (FL-TSA) is the intercurricular career and technical student organization for providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

Cooperative Training – OJT

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

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 Occupational Completion Point (OCP) or a Modified Occupational Completion Point (MOCP). If needed, a student may enroll in the same career and technical course more than once. Documentation should be included in the IEP that clearly indicates that it is anticipated that the student may need an additional year to complete an OCP/MOCP. The student should work on different competencies and new applications of competencies each year toward completion of the OCP/MOCP. After achieving the competencies identified for the year, the student earns credit for the course. It is important to ensure that credits earned by students are reported accurately. The district's information system must be designed to accept multiple credits for the same course number for eligible students with disabilities.

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

Florida Department of Education
Curriculum Framework

Program Title: **Engineering Pathways**
Program Type: **Non Career Preparatory**
Career Cluster: **Engineering & Technology Education**

Secondary – Non Career Preparatory	
Program Number	9400300
CIP Number	0821010102
Grade Level	9-12; 30, 31
Standard Length	5 credits
Teacher Certification	TEC ED 1 @2 ENG @7 7G PLTW PTE 7G
CTSO	Florida Technology Student Association (FL-TSA)
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 the applications of 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.

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. Although there are variations in course sequence depending on implementation, students typically (but are not required to) complete the three foundation courses (860550, 8600520, and 8600530), at least one of the elective courses, and the capstone course. Listed below are the courses that comprise this program. Note that the sequence of courses shown is not binding.

Recommended Grade	Course Number	Course Title	Length	Level	Graduation Requirement
9	8600550	Introduction to Engineering Design	1 credit	3	PA
10	8600520	Principles of Engineering	1 credit	3	PA
11,12	8600530	Digital Electronics	1 credit	3	PA
	8600560*	Computer Integrated Manufacturing **or**	1 credit	3	PA
	8600590*	Civil Engineering and Architecture **or**	1 credit	3	PA
	8600620*	Aerospace Engineering **or**	1 credit	3	PA
	8600630*	Biotechnical Engineering **or**	1 credit	3	PA
12	8600650**	Engineering Design and Development	1 credit	3	PA

(Graduation Requirement Abbreviations- EQ= Equally Rigorous Science, PA= Practical Arts, EC= Economics, VO= Career and Technical Education)

** Note: Students should select at least one of these courses to take in addition to the Digital Electronics course (8600530).*

*** Note: This course is intended to serve as a capstone course.*

Academic Alignment

Academic alignment is an ongoing, collaborative effort of professional educators specializing in the fields of science, mathematics, English/language arts, and Career and Technical Education (CTE). This initiative supports CTE programs by improving student performance through the integration of academic content within CTE courses. Career and Technical Education courses that have been aligned to the Next Generation Sunshine State Standards for Science and the Florida Standards for Mathematics and English/Language Arts will show the following data: the quantity of academic standards in the CTE course; the total number of standards contained in the academic course; and the percentage of alignment to the CTE course.

Courses	Anatomy/ Physiology Honors	Astronomy Solar/Galactic Honors	Biology 1	Chemistry 1	Earth-Space Science	Environmental Science	Genetics	Integrated Science	Marine Science 1 Honors	Physical Science	Physics 1
8600550	1/87 1%	4/80 5%	3/83 4%	4/69 6%	2/67 3%	5/70 7%	3/69 4%	3/82 4%	5/66 8%	4/74 5%	4/72 6%
8600520	1/87 1%	3/80 4%	2/83 2%	2/69 3%	2/67 3%	2/70 3%	1/69 1%	3/82 4%	2/66 3%	6/74 8%	6/72 8%
8600530	**	**	**	**	**	**	**	**	**	**	**
8600560	**	**	**	**	**	**	**	**	**	**	**
8600590	**	**	**	**	**	**	**	**	**	**	**
8600620	**	**	**	**	**	**	**	**	**	**	**
8600630	**	**	**	**	**	**	**	**	**	**	**

Courses	Anatomy/ Physiology Honors	Astronomy Solar/Galactic Honors	Biology 1	Chemistry 1	Earth-Space Science	Environmental Science	Genetics	Integrated Science	Marine Science 1 Honors	Physical Science	Physics 1
8600650	**	**	**	**	**	**	**	**	**	**	**

** *Alignment pending review* # *Alignment attempted, but no correlation to academic course*

Courses	Algebra 1	Algebra 2	Geometry	English 1	English 2	English 3	English 4
8600550	**	**	**	**	**	**	**
8600520	**	**	**	**	**	**	**
8600530	**	**	**	**	**	**	**
8600560	**	**	**	**	**	**	**
8600590	**	**	**	**	**	**	**
8600620	**	**	**	**	**	**	**
8600630	**	**	**	**	**	**	**
8600650	**	**	**	**	**	**	**

** *Alignment pending review* # *Alignment attempted, but no correlation to academic course*

Florida Standards for Technical Subjects

Florida Standards (FS) for English Language Arts and Literacy in History/Social Studies, Science, and Technical Subjects are the critical reading and writing literacy standards designed for grade 6 and above. These standards are predicated on teachers of history/social studies, science, and technical subjects using their content area expertise to help students meet the particular challenges of reading, writing, speaking, listening, and language in their respective fields. It is important to note that the 6-12 literacy standards in history/social studies, science, and technical subjects are not meant to replace content standards in those areas but rather to supplement them.

This curriculum framework incorporates the grades 9-10 reading and writing literacy standards in the first two courses of this CTE program and grade 11-12 reading and writing literacy standards in the third and fourth courses of this CTE program. The standards for Mathematical Practices describe varieties of expertise that educators at all levels should seek to develop in their students. These practices rest on important "processes and proficiencies" with longstanding importance in mathematics education. This curriculum framework incorporates the appropriate mathematical practices in the first four courses of this CTE program.

Common Career Technical Core – Career Ready Practices

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

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

2. Apply appropriate academic and technical skills.

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

4. Communicate clearly, effectively and with reason.

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

6. Demonstrate creativity and innovation.

7. Employ valid and reliable research strategies.

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

9. Model integrity, ethical leadership and effective management.

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

11. Use technology to enhance productivity.

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

Standards

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

01.0 Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Engineering Pathways.
02.0 Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Engineering Pathways.
03.0 Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Engineering Pathways.

Introduction to Engineering Design Content Standards

04.0 Demonstrate an understanding of the design process and the activities associated with each step.
05.0 Demonstrate skill in sketching and drawing, and describe their importance to engineering design.
06.0 Take, record, manipulate, and convert measurements using both standard and metric systems of linear measurement.
07.0 Create and assemble a prototype using CAD modeling software.
08.0 Demonstrate an understanding of mathematics and dimensioning associated with CAD design software.
09.0 Demonstrate an understanding of tolerances and their implications on an engineering design.
10.0 Demonstrate proficiency in designing and assembling parts using CAD software to animate the parts and control design constraints.
11.0 Create parts using CAD software, adhering to constraints provided in the design brief.
12.0 Explain the concept of fluid power, and the difference between hydraulic and pneumatic power systems
13.0 Describe the impact of visual design on the success or acceptability of an engineering design.
14.0 Demonstrate an understanding of reverse engineering.
15.0 Reverse engineer a product.
16.0 Demonstrate an understanding of design briefs and their role in the engineering design process.
17.0 Demonstrate an understanding of product lifecycle and its implications on successive engineering designs.
18.0 Actively participate on a virtual project team.

Principles of Engineering Content Standards

19.0 Demonstrate an understanding of the engineering field.
20.0 Demonstrate an understanding of engineering complexities ranging from simple machines to compound machine design.
21.0 Demonstrate an understanding of energy sources, their characteristics, and their renewability.
22.0 Perform mathematical operations specific to electrical systems.
23.0 Demonstrate an understanding of the applications of alternative energy solutions.
24.0 Demonstrate an understanding of insulation, the suitability of specific materials for use as insulation, and associated mathematics.
25.0 Analyze an energy-related problem and design a solution to the problem.
26.0 Demonstrate an understanding of machine control systems, logic, and devices.
27.0 Demonstrate an understanding of the characteristics, devices, components, limitations, and associated mathematics of hydraulic and pneumatic systems.
28.0 Demonstrate an understanding of the analysis of loads on physical systems in static equilibrium (statics).
29.0 Demonstrate an understanding of analyzing the material properties of products.
30.0 Perform tensile and stress tests on sample material.

31.0 Analyze problem related to materials and structures, and design a solution to the problem.
32.0 Design and create a control system based on given needs and constraints.
33.0 Design, create, test, and present a workable solution to a design problem involving hydraulic and/or pneumatic technology.
34.0 Apply principles of statistics to calculate the theoretical probability that an event will occur.
35.0 Apply principles of kinematics and statistics to design and present a workable solution to a design problem associated with bodies in motion.
36.0 Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Engineering Pathways.
37.0 Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Engineering Pathways.
38.0 Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Engineering Pathways.

Digital Electronics Content Standards

39.0 Demonstrate an understanding of the foundations of digital electronics.
40.0 Demonstrate an understanding of combinational logic analysis and design.
41.0 Demonstrate an understanding of sequential logic analysis and design.
42.0 Demonstrate an understanding of the role of microcontrollers in process control.

Computer Integrated Manufacturing Technical Content Standards

43.0 Demonstrate an understanding of manufacturing, its history, models, and procedures.
44.0 Demonstrate an understanding of control systems and methods to describe or document their processes.
45.0 Demonstrate an understanding of the cost of manufacturing.
46.0 Demonstrate proficiency in designing products for manufacturability.
47.0 Demonstrate an understanding of manufacturing processes.
48.0 Demonstrate an understanding of computer numeric control (CNC) as it relates to product design and development.
49.0 Demonstrate an understanding of automation and robotics relative to the manufacturing process.
50.0 Demonstrate an understanding of the elements of power and the associated mathematics.
51.0 Build, program, and configure a robot to perform predefined tasks.
52.0 Demonstrate an understanding of the elements of Computer Integrated Manufacturing (CIM).
53.0 Demonstrate proficiency in designing an efficient flexible manufacturing system (FMS) that contains CIM elements.

Civil Engineering & Architecture Technical Content Standards

54.0 Demonstrate an understanding of civil engineering and architecture, its history, innovations, and evolution of styles and materials.
55.0 Demonstrate an understanding of the civil engineering and architecture field.
56.0 Demonstrate an understanding of residential building structure, elements of design, and associated processes.
57.0 Perform mathematical operations associated with cost and efficiency analysis of a residential design.
58.0 Demonstrate proficiency in designing a residential structure, ascertaining appropriateness of electrical and plumbing elements, and considering site constraints and applicable codes.
59.0 Demonstrate proficiency in designing commercial building structures, including compliance with building and zoning regulations, appropriate wall structures, and appropriate material selection.
60.0 Demonstrate proficiency in designing wall, floor, and foundation structures to meet specific load requirements using structural analysis software.

61.0 Demonstrate proficiency in designing heating, ventilation, and air conditioning services and utilities for a commercial project to achieve energy conservation.
62.0 Demonstrate proficiency in creating a commercial site design that considers soil characteristics, storm water runoff, and specification/code requirements.
63.0 Design a commercial building.
64.0 Create and deliver a presentation of a commercial building design.

Aerospace Engineering Technical Content Standards

65.0 Demonstrate an understanding of the foundations of flight.
66.0 Demonstrate an understanding of aerodynamics fundamentals and aerodynamic testing.
67.0 Demonstrate an understanding of propulsion systems and their performance factors.
68.0 Demonstrate an understanding of propulsion-less flight.
69.0 Demonstrate an understanding of technologies used in aerial navigation.
70.0 Demonstrate an understanding of rocketry and associated performance factors.
71.0 Demonstrate an understanding of rocket/satellite-based aerial photography.
72.0 Demonstrate an understanding of orbital mechanics.
73.0 Demonstrate an understanding of gravity and its effects on the human body.
74.0 Demonstrate an understanding of composite materials and their fabrication.
75.0 Demonstrate an understanding of thermal protection systems.
76.0 Demonstrate an understanding of intelligent vehicles.

Biotechnical Engineering Technical Content Standards

77.0 Demonstrate an understanding of documentation procedures associated with biotechnical engineering.
78.0 Demonstrate an understanding of the evolution of biotechnical engineering.
79.0 Demonstrate an understanding of the role of values, morals, and ethics in the field of biotechnology.
80.0 Demonstrate an understanding of the roles of forensics, reverse engineering, and genetic engineering to biotechnology applications.
81.0 Demonstrate an understanding of fermentation as it relates to the production of renewable energy.
82.0 Demonstrate an understanding of engineering design principles relative to the field of biotechnology.
83.0 Demonstrate an understanding of engineering as it relates to the design of prosthetic devices.
84.0 Research heart diseases, disorders, treatment options, and procedures.

Engineering Design & Development Technical Content Standards

85.0 Identify, define, and justify a technical design problem for resolution.
86.0 Conduct research and investigation into the stated problem.
87.0 Perform and graphically represent an evaluation of proposed design solutions using specific criteria, including product specifications.
88.0 Design a solution to the problem and create a working prototype for testing.
89.0 Evaluate and select appropriate testing methodologies for testing the product, conduct product testing, refine the design as needed, and document the process and results.
90.0 Create and deliver a formal presentation in a suitable form of the solution to the problem.

Florida Department of Education
Student Performance Standards

Course Title: **Introduction to Engineering Design**
Course Number: **8600550**
Course Credit: **1**

Course Description:

This course exposes students to the design process, research and analysis, teamwork, communication methods, global and human impacts, engineering standards, and technical documentation. Students will employ engineering and scientific concepts in the solution of engineering design problems. In addition, they will learn to use 3D solid modeling design software to design solutions to problems. Students will develop problem-solving skills and apply their knowledge of research and design to create solutions, document the process, and communicate the results.

Florida Standards			Correlation to CTE Program Standard #
01.0	Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Engineering Pathways.		
	01.01 Key Ideas and Details		
	01.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. LAFS.910.RST.1.1	
	01.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.910.RST.1.2	
	01.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.910.RST.1.3	
	01.02 Craft and Structure		
	01.02.1	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. LAFS.910.RST.2.4	
	01.02.2	Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). LAFS.910.RST.2.5	

Florida Standards			Correlation to CTE Program Standard #
	01.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. LAFS.910.RST.2.6	
01.03	Integration of Knowledge and Ideas		
	01.03.1	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. LAFS.910.RST.3.7	
	01.03.2	Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. LAFS.910.RST.3.8	
	01.03.3	Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. LAFS.910.RST.3.9	
01.04	Range of Reading and Level of Text Complexity		
	01.04.1	By the end of grade 9, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	01.04.2	By the end of grade 10, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 9–10 text complexity band independently and proficiently. LAFS.910.RST.4.10	
02.0	Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Engineering Pathways.		
02.01	Text Types and Purposes		
	02.01.1	Write arguments focused on discipline-specific content. LAFS.910.WHST.1.1	
	02.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.910.WHST.1.2	
02.02	Production and Distribution of Writing		
	02.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.910.WHST.2.4	

Florida Standards			Correlation to CTE Program Standard #
	02.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.910.WHST.2.5	
	02.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. LAFS.910.WHST.2.6	
	02.03	Research to Build and Present Knowledge	
	02.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.910.WHST.3.7	
	02.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. LAFS.910.WHST.3.8	
	02.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.910.WHST.3.9	
	02.04	Range of Writing	
	02.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.910.WHST.4.10	
03.0	Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Engineering Pathways.		
	03.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	
	03.02	Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
	03.03	Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	

Florida Standards	Correlation to CTE Program Standard #
03.04 Model with mathematics. MAFS.K12.MP.4.1	
03.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
03.06 Attend to precision. MAFS.K12.MP.6.1	
03.07 Look for and make use of structure. MAFS.K12.MP.7.1	
03.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA.

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
04.0 Demonstrate an understanding of the design process and the activities associated with each step--The student will be able to:		SC.912.N.1.1; 3.5
04.01 Apply engineering notebook standards and protocols.		
04.02 Identify and apply group brainstorming techniques and the rules associated with brainstorming.		
04.03 Create and deliver a PowerPoint presentation depicting research on the impact of innovation on the evolution of a product.		
04.04 Use online and published works to research aspects of design problems.		
04.05 Describe the design process steps used in given scenarios.		
05.0 Demonstrate skill in sketching and drawing, and describe their importance to engineering design--The student will be able to:		SC.912.N.1.7
05.01 Identify, sketch, and explain the function of points, construction lines, object lines, and hidden lines.		
05.02 Plot points on grid paper to aid in the creation of sketches and drawings.		
05.03 Explain the concepts of technical sketching and drawing.		
05.04 Sketch an isometric view of simple geometric solids.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
05.05	Explain how an oblique view of simple geometric solids differs from an isometric view.		
05.06	Sketch one-point, two-point, and three-point perspectives of simple geometric solids.		
05.07	Describe the concept of proportion as it relates to freehand sketching.		
05.08	Sketch multiview drawings of simple geometric solids.		
05.09	Determine the front view for a given object.		
06.0	Take, record, manipulate, and convert measurements using both standard and metric systems of linear measurement--The student will be able to:		
06.01	Research and design a presentation piece depicting the origins of the measurement systems.		
06.02	Measure and record linear distances using a scale to a precision of 1/16 inch and 1 mm.		
06.03	Measure and record linear distances using a dial caliper to a precision of 0.001 inch.		
06.04	Add and subtract U.S. standard and metric linear measurements.		
06.05	Convert linear distance measurements from inches to millimeters and vice versa.		
06.06	Apply linear dimensions to a multiview drawing.		
06.07	Calculate the mean, mode, median, and range of a data set.		
06.08	Create a histogram of recorded measurements showing data elements or class intervals, and frequency.		
07.0	Create and assemble a prototype using CAD modeling software--The student will be able to:		
07.01	Brainstorm and sketch possible solutions to an existing design problem.		
07.02	Select an approach that meets or satisfies the constraints given in a design brief.		
07.03	Create simple extruded solid Computer Aided Design (CAD) models from dimensioned sketches.		
07.04	Generate dimensioned multiview drawings from simple CAD models.		
07.05	Measure and Fabricate parts for a functional prototype from the CAD multiview drawings.		
07.06	Assemble the product using the CAD modeling software.		
07.07	Test and evaluate the prototype and record results.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	07.08 Apply geometric and numeric constraints to CAD sketches.		
	07.09 Identify the purpose of packaging in the design of consumer products.		
08.0	Demonstrate an understanding of mathematics and dimensioning associated with CAD design software--The student will be able to:		
	08.01 Identify common geometric shapes and forms by name.		
	08.02 Calculate the area of simple geometric shapes.		
	08.03 Calculate the surface area and volume of simple geometric forms.		
	08.04 Identify and explain the various geometric relationships that exist between the elements of two-dimensional shapes and three-dimensional forms.		
	08.05 Identify and define the axes, planes, and sign conventions associated with the Cartesian coordinate system.		
	08.06 Apply geometric and numeric constraints to CAD sketches.		
	08.07 Utilize sketch-based, work reference, and placed features to develop solid CAD models from dimensioned drawings.		
	08.08 Explain how a given object's geometry is the result of sequential additive and subtractive processes.		
	08.09 Explain the differences between size and location dimensions.		
	08.10 Differentiate between datum dimensioning and chain dimensioning.		
	08.11 Identify and dimension fillets, rounds, diameters, chamfers, holes, slots, and screw threads in orthographic projection drawings.		
	08.12 Explain the rules that are associated with the application of dimensions to multiview drawings.		
09.0	Demonstrate an understanding of tolerances and their implications on an engineering design--The student will be able to:		
	09.01 Identify, sketch, and explain the difference between general tolerances, limit dimensions, unilateral, and bilateral tolerances.		
	09.02 Differentiate between clearance and interference fits.		
	09.03 Sketch and model an auxiliary view of a given object to communicate the true size and shape of its inclined surface.		
	09.04 Describe the purpose and demonstrate the application of section lines and cutting plane lines in a section view drawing.		
	09.05 Sketch a full and half section view of a given object to communicate its interior features.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	09.06 Identify algebraic relationships between the dimensional values of a given object.		
10.0	Demonstrate proficiency in designing and assembling parts using CAD software to animate the parts and control design constraints--The student will be able to:		
	10.01 Apply assembly constraints to individual CAD models to create mechanical systems.		
	10.02 Perform part manipulation during the creation of an assembly model.		
	10.03 Explain how assembly constraints are used to systematically remove the degrees of freedom for a set of components in a given assembly.		
	10.04 Create an exploded model of a given assembly.		
	10.05 Determine ratios and apply algebraic formulas to animate multiple parts within an assembly model.		
	10.06 Create and describe the purpose of the following items: exploded isometric assembly view, balloons, and parts list.		
11.0	Create parts using CAD software, adhering to constraints provided in the design brief--The student will be able to:		
	11.01 Brainstorm and sketch possible solutions to an existing design problem.		
	11.02 Create a decision making matrix.		
	11.03 Select an approach that meets or satisfies the constraints given in a design brief.		
	11.04 Create solid computer-aided design (CAD) models of each part from dimensioned sketches using a variety of methods.		
	11.05 Apply geometric numeric and parametric constraints to form CAD modeled parts.		
	11.06 Generate dimensioned multiview drawings from simple CAD modeled parts.		
	11.07 Assemble the product using the CAD modeling software.		
	11.08 Explain what constraints are and why they are included in a design brief.		
	11.09 Create a three-fold brochure marketing the designed solution for the chosen problem, such as a consumer product, a dispensing system, a new form of control system, or extend a product design to meet a new requirement.		
12.0	Explain the concept of fluid power, and the difference between hydraulic and pneumatic power systems--The student will be able to:		
	12.01 Define fluid power		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
12.02	Define hydraulic system		
12.03	Define pneumatic system		
12.04	Explain the uses of fluid power systems in current society and cite specific examples.		
12.05	Describe the advantages of fluid power systems		
12.06	Describe the disadvantages of fluid power systems		
12.07	Discuss the historical impacts related to the development of the fluid power industry.		
13.0	Describe the impact of visual design on the success or acceptability of an engineering design--The student will be able to:		
13.01	Identify visual design elements within a given object.		
13.02	Explain how visual design principles were used to manipulate design elements within a given object.		
13.03	Explain what aesthetics is, and how it contributes to a design's commercial success.		
13.04	Identify the purpose of packaging in the design of consumer products.		
13.05	Identify visual design principles and elements that are present within marketing ads.		
13.06	Identify the intent of a given marketing ad and demographics of the target consumer group for which it was intended.		
14.0	Demonstrate an understanding of reverse engineering--The student will be able to:		
14.01	Define reverse engineering and describe its value to engineering design.		
14.02	Describe the value to engineers of reverse engineering products.		
14.03	Describe the function of a given manufactured object as a sequence of operations through visual analysis and inspection (prior to dissection).		
15.0	Reverse engineer a product--The student will be able to:		SC.912.N.2.2
15.01	Describe the differences between joinery, fasteners, and adhesives.		
15.02	Identify the types of structural connections that exist in a given object.		
15.03	Use dial calipers to precisely measure outside and inside diameter, hole depth, and object thickness.		
15.04	Identify a given object's material type.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
15.05	Identify material processing methods that are used to manufacture the components of a given commercial product.		
15.06	Assign a density value to a material, and apply it to a given solid CAD model.		
15.07	Perform computer analysis to determine mass, volume, and surface area of a given object.		
16.0	Demonstrate an understanding of design briefs and their role in the engineering design process--The student will be able to:		
16.01	Write design briefs that focus on product innovation.		
16.02	Identify group brainstorming techniques and the rules associated with brainstorming.		
16.03	Use decision matrices to make design decisions.		
16.04	Explain the difference between invention and innovation.		
17.0	Demonstrate an understanding of product lifecycle and its implications on successive engineering designs--The student will be able to:		SC.912.L.17.16, 17, 20
17.01	Create and deliver a presentation depicting the lifecycle of a product as a timeline based on research.		
17.02	Describe how a product may be recycled and used to make other products after its lifecycle is complete.		
17.03	Identify the five steps of a product's lifecycle and propose recyclable uses for the material once the lifecycle of the product is complete.		
18.0	Actively participate on a virtual project team--The student will be able to:		
18.01	Explain why teams of people are used to solve problems.		
18.02	Identify group norms that allow a virtual design team to function efficiently.		
18.03	Establish file management and file revision protocols to ensure the integrity of current information.		
18.04	Use internet resources, such as email, to communicate with a virtual design team member throughout a design challenge.		
18.05	Identify strategies for addressing and solving conflicts that occur between team members.		
18.06	Create a Gantt chart to manage the various phases of their design challenge.		

Florida Department of Education
Student Performance Standards

Course Title: **Principles of Engineering**
Course Number: **8600520**
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 required knowledge and skills in mathematics, science, and technology. Through problem-based learning strategies, students study key engineering topics, including mechanisms, energy sources, energy applications, machine control, fluid power, statics, material properties, material testing, statistics, and kinematics. Exploring various technology systems and manufacturing processes help students learn how engineers and technicians use math, science and technology in an engineering problem solving process to benefit people. The course also includes concerns about social and political consequences of technological change.

Florida Standards			Correlation to CTE Program Standard #
01.0	Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Engineering Pathways.		
	01.01 Key Ideas and Details		
	01.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. LAFS.910.RST.1.1	
	01.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.910.RST.1.2	
	01.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.910.RST.1.3	
	01.02 Craft and Structure		
	01.02.1	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. LAFS.910.RST.2.4	

Florida Standards			Correlation to CTE Program Standard #
	01.02.2	Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). LAFS.910.RST.2.5	
	01.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. LAFS.910.RST.2.6	
01.03	Integration of Knowledge and Ideas		
	01.03.1	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. LAFS.910.RST.3.7	
	01.03.2	Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. LAFS.910.RST.3.8	
	01.03.3	Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. LAFS.910.RST.3.9	
01.04	Range of Reading and Level of Text Complexity		
	01.04.1	By the end of grade 9, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	01.04.2	By the end of grade 10, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 9–10 text complexity band independently and proficiently. LAFS.910.RST.4.10	
02.0	Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Engineering Pathways.		
02.01	Text Types and Purposes		
	02.01.1	Write arguments focused on discipline-specific content. LAFS.910.WHST.1.1	
	02.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.910.WHST.1.2	

Florida Standards			Correlation to CTE Program Standard #
02.02	Production and Distribution of Writing		
	02.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.910.WHST.2.4	
	02.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.910.WHST.2.5	
	02.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. LAFS.910.WHST.2.6	
02.03	Research to Build and Present Knowledge		
	02.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.910.WHST.3.7	
	02.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. LAFS.910.WHST.3.8	
	02.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.910.WHST.3.9	
02.04	Range of Writing		
	02.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.910.WHST.4.10	
03.0	Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Engineering Pathways.		
	03.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	

Florida Standards	Correlation to CTE Program Standard #
03.02 Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
03.03 Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
03.04 Model with mathematics. MAFS.K12.MP.4.1	
03.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
03.06 Attend to precision. MAFS.K12.MP.6.1	
03.07 Look for and make use of structure. MAFS.K12.MP.7.1	
03.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA.

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
19.0 Demonstrate an understanding of the engineering field. – The student will be able to:		
19.01 Differentiate between engineering and engineering technology.		
19.02 Identify and differentiate among different engineering disciplines.		
20.0 Demonstrate an understanding of engineering complexities ranging from simple machines to compound machine design. – The student will be able to:		SC.912.P.10.3
20.01 Measure forces and distances related to mechanisms.		
20.02 Distinguish between the six simple machines, their attributes, and components.		
20.03 Calculate mechanical advantage and drive ratios of mechanisms.		
20.04 Design, create, and test gear, pulley, and sprocket systems.		
20.05 Calculate work and power in mechanical systems.		
20.06 Determine efficiency in a mechanical system.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	20.07 Design, create, test, and evaluate a compound machine design.		
21.0	Demonstrate an understanding of energy sources, their characteristics, and their renewability. – The student will be able to:		SC.912.L.17.11
	21.01 Identify and categorize energy sources as nonrenewable, renewable, or inexhaustible.		
	21.02 Create and deliver a presentation to explain a specific energy source.		
22.0	Perform mathematical operations specific to electrical systems. – The student will be able to:		SC.912.P.10.15
	22.01 Define the possible types of power conversion.		
	22.02 Calculate work and power.		
	22.03 Demonstrate the correct use of a digital multimeter.		
	22.04 Calculate power in a system that converts energy from electrical to mechanical.		
	22.05 Determine efficiency of a system that converts an electrical input to a mechanical output.		
	22.06 Calculate circuit resistance, current, and voltage using Ohm's law.		
	22.07 Understand the advantages and disadvantages of parallel and series circuit design in an application.		
23.0	Demonstrate an understanding of the applications of alternative energy solutions. – The student will be able to:		
	23.01 Test and apply the relationship between voltage, current, and resistance relating to a photovoltaic cell and a hydrogen fuel cell.		
	23.02 Experiment with a solar hydrogen system to produce mechanical power.		
24.0	Demonstrate an understanding of insulation, the suitability of specific materials for use as insulation, and associated mathematics. – The student will be able to:		
	24.01 Design, construct, and test recyclable insulation materials.		
	24.02 Test and apply the relationship between R-values and recyclable insulation.		
	24.03 Complete calculations for conduction, R-values, and radiation.		
25.0	Analyze an energy-related problem and design a solution to the problem. – The student will be able to:		SC.912.N.1.1
	25.01 Brainstorm and sketch possible solutions to the design problem.		
	25.02 Create a decision-making matrix for the design problem.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	25.03 Select an approach that meets or satisfies the constraints provided in the design brief.		
	25.04 Create a detailed pictorial sketch or use 3D modeling software to document the best choice, based upon the design team's decision matrix.		
	25.05 Present a workable solution to the design problem.		
26.0	Demonstrate an understanding of machine control systems, logic, and devices. – The student will be able to:		
	26.01 Create detailed flow charts utilizing a computer software application.		
	26.02 Create control system operating programs utilizing computer software.		
	26.03 Create system control programs that utilize flowchart logic.		
	26.04 Choose appropriate inputs and outputs devises based on the need of a technological system.		
	26.05 Differentiate between the characteristics of digital and analog devices.		
	26.06 Judge between open and closed loop systems in order to choose the most appropriate system for a given technological problem.		
	26.07 Design and create a control system based on given needs and constraints.		
27.0	Demonstrate an understanding of the characteristics, devices, components, limitations, and associated mathematics of hydraulic and pneumatic systems. – The student will be able to:		SC.912.P.12.10
	27.01 Identify devices that utilize fluid power.		
	27.02 Identify and explain basic components and functions of fluid power devices.		
	27.03 Differentiate between the characteristics of pneumatic and hydraulic systems.		
	27.04 Distinguish between hydrodynamic and hydrostatic systems.		
	27.05 Design, create, and test a hydraulic device.		
	27.06 Design, create, and test a pneumatic device.		
	27.07 Calculate values in a fluid power system utilizing Pascal's Law.		
	27.08 Distinguish between pressure and absolute pressure.		
	27.09 Distinguish between temperature and absolute temperature.		
	27.10 Calculate values in a pneumatic system utilizing the perfect gas laws.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	27.11 Calculate flow rate, flow velocity, and mechanical advantage in a hydraulic system.		
28.0	Demonstrate an understanding of the analysis of loads on physical systems in static equilibrium (statics). – The student will be able to:		SC.912.P.12.1
	28.01 Create free body diagrams of objects, identifying all forces acting on the object.		
	28.02 Mathematically locate the centroid of structural members.		
	28.03 Calculate moment of inertia of structural members.		
	28.04 Differentiate between scalar and vector quantities.		
	28.05 Identify magnitude, direction, and sense of a vector.		
	28.06 Calculate the X and Y components given a vector.		
	28.07 Calculate moment forces given a specified axis.		
	28.08 Use equations of equilibrium to calculate unknown forces.		
	28.09 Use the method of joints strategy to determine forces in the members of a statically determinate truss.		
29.0	Demonstrate an understanding of analyzing the material properties of products. – The student will be able to:		
	29.01 Investigate specific material properties related to a common household product.		
	29.02 Conduct investigative non-destructive material property tests on selected common household products. Property testing conducted to identify continuity, ferrous metal, hardness, and flexure.		
	29.03 Calculate weight, volume, mass, density, and surface area of selected common household product		
	29.04 Identify the manufacturing processes used to create the selected common household product.		
	29.05 Identify the recycling codes.		
30.0	Perform tensile and stress tests on sample material. – The student will be able to:		
	30.01 Obtain measurements of material samples.		
	30.02 Tensile test a material test sample.		
	30.03 Identify and calculate test sample material properties using a stress strain curve.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
31.0	Analyze problem related to materials and structures, and design a solution to the problem. – The student will be able to:		
31.01	Brainstorm and sketch possible solutions to the design problem.		
31.02	Create a decision making matrix for the design problem.		
31.03	Select an approach that meets or satisfies the constraints given in the design brief.		
31.04	Create a detailed pictorial sketch or use 3D modeling software to document the best choice, based upon your team's decision matrix.		
31.05	Present a workable design solution.		
32.0	Design and create a control system based on given needs and constraints. – The student will be able to:		
32.01	Create detailed flow charts utilizing a computer software application.		
32.02	Create control system operating programs utilizing computer software.		
32.03	Create system control programs that utilize flowchart logic.		
32.04	Choose appropriate inputs and output devices based on the need of a technological system.		
32.05	Differentiate between the characteristics of digital and analog devices.		
32.06	Judge between open and closed loop systems in order to choose the most appropriate system for a given technological problem.		
33.0	Design, create, test, and present a workable solution to a design problem involving hydraulic and/or pneumatic technology. – The student will be able to:		
33.01	Identify devices that utilize fluid power.		
33.02	Identify and explain basic components and functions of fluid power devices.		
33.03	Differentiate between the characteristics of pneumatic and hydraulic systems.		
33.04	Distinguish between hydrodynamic and hydrostatic systems.		
33.05	Design, create, and test a hydraulic device.		
33.06	Design, create, and test a pneumatic device.		
33.07	Calculate values in a fluid power system utilizing Pascal's Law.		
33.08	Distinguish between pressure and absolute pressure.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
33.09	Distinguish between temperature and absolute temperature.		
33.10	Calculate values in a pneumatic system, utilizing the perfect gas laws.		
33.11	Calculate flow rate, flow velocity, and mechanical advantage in a hydraulic system.		
33.12	Brainstorm and sketch possible solutions to the design problem.		
33.13	Create a decision-making matrix.		
33.14	Select an approach to satisfy the constraints provided in the design brief.		
33.15	Create a detailed pictorial sketch or use 3D modeling software to illustrate the best choice derived from the design team's decision matrix.		
34.0	Apply principles of statistics to calculate the theoretical probability that an event will occur. – The student will be able to:		
34.01	Calculate the experimental frequency distribution of an event occurring.		
34.02	Apply the Bernoulli process to events that only have two distinct possible outcomes.		
34.03	Apply AND, OR, and NOT logic to probability.		
34.04	Apply Bayes' theorem to calculate the probability of multiple events occurring.		
34.05	Create a histogram to illustrate frequency distribution.		
34.06	Calculate the central tendency of a data array, including mean, median, and mode.		
34.07	Calculate data variation, including range, standard deviation, and variance.		
35.0	Apply principles of kinematics and statistics to design and present a workable solution to a design problem associated with bodies in motion. – The student will be able to:		SC.912.P.12.2, 3
35.01	Calculate distance, displacement, speed, velocity, and acceleration from data.		
35.02	Design, build, and test a vehicle that stores and releases potential energy for propulsion.		
35.03	Calculate acceleration due to gravity given data from a free fall device.		
35.04	Calculate the X and Y components of a projectile motion.		
35.05	Determine the needed angle to launch a projectile a specific range given the projectile's initial velocity.		
35.06	Brainstorm and sketch possible solutions to an existing design problem.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
35.07	Create a decision-making matrix for their design problem.		
35.08	Select an approach that meets or satisfies the constraints provided in a design brief.		
35.09	Create a detailed pictorial sketch or use 3D modeling software to document the best choice, based upon the design team's decision matrix.		
35.10	Present a workable solution to the design problem.		

Florida Department of Education
Student Performance Standards

Course Title: **Digital Electronics**
Course Number: **8600530**
Course Credit: **1**

Course Description:
This is a course in applied logic that encompasses the application of electronic circuits and devices. Students are exposed to the design process of combinational and sequential logic design, teamwork, communication methods, engineering standards, and technical documentation. Computer simulation software is used to design and test digital circuitry prior to the actual construction of circuits and devices.

Florida Standards			Correlation to CTE Program Standard #
36.0	Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Engineering Pathways.		
	36.01 Key Ideas and Details		
	36.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. LAFS.1112.RST.1.1	
	36.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.1112.RST.1.2	
	36.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.1112.RST.1.3	
	36.02 Craft and Structure		
	36.02.1	Determine the meaning of symbols key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. LAFS.1112.RST.2.4	
	36.02.2	Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. LAFS.1112.RST.2.5	
	36.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. LAFS.1112.RST.2.6	

Florida Standards			Correlation to CTE Program Standard #
	36.03	Integration of Knowledge and Ideas	
	36.03.1	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g. quantitative data, video, multimedia) in order to address a question or solve a problem. LAFS.1112.RST.3.7	
	36.03.2	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. LAFS.1112.RST.3.8	
	36.03.3	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. LAFS.1112.RST.3.9	
	36.04	Range of Reading and Level of Text Complexity	
	36.04.1	By the end of grade 11, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	36.04.2	By the end of grade 12, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 11–CCR text complexity band independently and proficiently. LAFS.1112.RST.4.10	
37.0	Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Engineering Pathways.		
	37.01	Text Types and Purposes	
	37.01.1	Write arguments focused on discipline-specific content. LAFS.1112.WHST.1.1	
	37.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.1112.WHST.1.2	
	37.02	Production and Distribution of Writing	
	37.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.1112.WHST.2.4	

Florida Standards			Correlation to CTE Program Standard #
	37.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.1112.WHST.2.5	
	37.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. LAFS.1112.WHST.2.6	
	37.03	Research to Build and Present Knowledge	
	37.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.1112.WHST.3.7	
	37.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. LAFS.1112.WHST.3.8	
	37.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.1112.WHST.3.9	
	37.04	Range of Writing	
	37.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.1112.WHST.4.10	
38.0	Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Engineering Pathways.		
	38.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	
	38.02	Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
	38.03	Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
	38.04	Model with mathematics. MAFS.K12.MP.4.1	

Florida Standards	Correlation to CTE Program Standard #
38.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
38.06 Attend to precision. MAFS.K12.MP.6.1	
38.07 Look for and make use of structure. MAFS.K12.MP.7.1	
38.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
39.0	Demonstrate an understanding of the foundations of digital electronics. – The student will be able to:		
39.01	Describe and apply three common notational forms of expressing numbers.		
39.02	Identify and describe the operation of common electronic components.		
39.03	Perform basic soldering techniques and printed circuit board construction.		
39.04	Define and apply Ohm's Law and Kirchhoff's Laws in the design of series and parallel electronic circuitry.		
39.05	Analyze simple analog and digital circuits using common electronic test equipment and tools.		
39.06	Determine the characteristics of analog and digital signals.		
39.07	Translate data specifications into truth tables and extract logical expressions.		
39.08	Use Boolean algebra and DeMorgan's Theorem to simplify logic expressions.		
40.0	Demonstrate an understanding of combinational logic analysis and design. – The student will be able to:		
40.01	Describe the operation of basic logic components, including gates, inverters, and flip-flops.		
40.02	Design a combinational logic circuit using basic logic gates.		
40.03	Simulate and prototype a logic circuit.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	40.04 Design a combinational logic circuit incorporating negative logic.		
	40.05 Simulate and prototype a logic circuit employing negative logic.		
	40.06 Design half-adder, full-adder, and binary adder logic circuits using exclusive logic.		
	40.07 Design a combinational logic circuit using a programmable logic device.		
	40.08 Simulate and prototype a combinational logic circuit employing a programmable logic device.		
	40.09 Analyze and design basic flip-flop applications, including event detection circuits, data synchronizers, shift registers, and frequency dividers.		
41.0	Demonstrate an understanding of sequential logic analysis and design. – The student will be able to:		
	41.01 Design, simulate, and prototype a basic flip-flop application.		
	41.02 Design, simulate, and prototype SSI and MSI asynchronous counters.		
	41.03 Describe the components of a state machine.		
	41.04 Design, simulate, and prototype state machines using discrete or programmable logic.		
42.0	Demonstrate an understanding of the role of microcontrollers in process control. – The student will be able to:		
	42.01 Program and test an autonomous robot.		
	42.02 Flowchart a microcontroller program to maneuver a robot.		
	42.03 Program a microcontroller to maneuver a robot.		

Florida Department of Education
Student Performance Standards

Course Title: **Computer Integrated Manufacturing**
Course Number: **8600560**
Course Credit: **1**

Course Description:
This course applies principles of robotics and automation. The course builds on computer solid modeling skills developed in Introduction to Engineering Design. Students use CNC equipment to produce actual models of their three-dimensional designs. Fundamental concepts of robotics used in automated manufacturing, and design analysis are included.

Florida Standards			Correlation to CTE Program Standard #
36.0	Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Engineering Pathways.		
	36.01 Key Ideas and Details		
	36.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. LAFS.1112.RST.1.1	
	36.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.1112.RST.1.2	
	36.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.1112.RST.1.3	
	36.02 Craft and Structure		
	36.02.1	Determine the meaning of symbols key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. LAFS.1112.RST.2.4	
	36.02.2	Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. LAFS.1112.RST.2.5	
	36.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. LAFS.1112.RST.2.6	

Florida Standards			Correlation to CTE Program Standard #
36.03	Integration of Knowledge and Ideas		
	36.03.1	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g. quantitative data, video, multimedia) in order to address a question or solve a problem. LAFS.1112.RST.3.7	
	36.03.2	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. LAFS.1112.RST.3.8	
	36.03.3	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. LAFS.1112.RST.3.9	
36.04	Range of Reading and Level of Text Complexity		
	36.04.1	By the end of grade 11, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	36.04.2	By the end of grade 12, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 11–CCR text complexity band independently and proficiently. LAFS.1112.RST.4.10	
37.0	Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Engineering Pathways.		
37.01	Text Types and Purposes		
	37.01.1	Write arguments focused on discipline-specific content. LAFS.1112.WHST.1.1	
	37.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.1112.WHST.1.2	
37.02	Production and Distribution of Writing		
	37.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.1112.WHST.2.4	

Florida Standards			Correlation to CTE Program Standard #
	37.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.1112.WHST.2.5	
	37.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. LAFS.1112.WHST.2.6	
	37.03	Research to Build and Present Knowledge	
	37.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.1112.WHST.3.7	
	37.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. LAFS.1112.WHST.3.8	
	37.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.1112.WHST.3.9	
	37.04	Range of Writing	
	37.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.1112.WHST.4.10	
38.0	Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Engineering Pathways.		
	38.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	
	38.02	Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
	38.03	Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	

Florida Standards	Correlation to CTE Program Standard #
38.04 Model with mathematics. MAFS.K12.MP.4.1	
38.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
38.06 Attend to precision. MAFS.K12.MP.6.1	
38.07 Look for and make use of structure. MAFS.K12.MP.7.1	
38.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
43.0 Demonstrate an understanding of manufacturing, its history, models, and procedures. – The student will be able to:		
43.01 Explore manufacturing through research and projects.		
43.02 Understand what the enterprise wheel represents and how it represents the overall manufacturing scheme.		
43.03 Research a topic in manufacturing, develop a presentation, and present findings to a group.		
43.04 Explain the different procedures used in manufacturing.		
44.0 Demonstrate an understanding of control systems and methods to describe or document their processes. – The student will be able to:		
44.01 Identify basic flowcharting symbols and discuss their functions.		
44.02 Create a flowchart that portrays a manufacturing process.		
44.03 Apply flowcharting to areas other than manufacturing.		
44.04 Identify a control system and explain its application to manufacturing.		
44.05 Model and create a program to control an automated system.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
45.0	Demonstrate an understanding of the cost of manufacturing. – The student will be able to:		
45.01	Create a control system that replicates a factory cell.		
45.02	Maximize the efficiency of the manufacturing system with respect to time and cost.		
45.03	Compare the efficiency of running multiple systems against that of one large system.		
46.0	Demonstrate proficiency in designing products for manufacturability. – The student will be able to:		
46.01	Use the design process.		
46.02	Use knowledge of design to analyze products with flaws.		
46.03	Use calculated volume, mass, surface area of parts to determine material cost, waste, and packaging requirements.		
46.04	Use solid modeling software to improve a flawed design.		
46.05	Determine whether a product is safe for a given audience (e.g., children under the age of three).		
46.06	Make ethical decisions about manufacturing.		
46.07	Create a product using solid modeling software.		
47.0	Demonstrate an understanding of manufacturing processes. – The student will be able to:		
47.01	Explain the difference between primary and secondary manufacturing processes.		
47.02	Analyze a product to propose the manufacturing processes used to create it.		
47.03	Explore manufacturing processes via research.		
47.04	Explore prototyping processes.		
48.0	Demonstrate an understanding of computer numeric control (CNC) as it relates to product design and development. – The student will be able to:		
48.01	Identify machines when given a process and identify the process that a given machine performs.		
48.02	Determine the appropriate speed rate for a given material using a tool with a given diameter.		
48.03	Determine the feed rate for a given material using a tool with a given diameter.		
48.04	Read and interpret G & M codes.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	48.05 Transfer the drawings made in CAD to a CAM program.		
	48.06 Create numerical code using a CAM program.		
	48.07 Verify the creation of a part using simulation software.		
	48.08 Create parts using the machines demonstrated by the instructor.		
	48.09 Create a product on the computer using knowledge of manufacturing processes.		
49.0	Demonstrate an understanding of automation and robotics relative to the manufacturing process. – The student will be able to:		
	49.01 Research a topic in automation.		
	49.02 Identify the advantages and disadvantages of robotic labor versus human labor.		
	49.03 Explore materials handling.		
	49.04 Create and program virtual robotic work cells with simulation software.		
	49.05 Program the interface between a robot and another machine.		
50.0	Demonstrate an understanding of the elements of power and the associated mathematics. – The student will be able to:		
	50.01 Identify the three main power types.		
	50.02 Solve problems involving electrical, pneumatic, and mechanical power.		
	50.03 Convert power between units.		
	50.04 Calculate torque and use it to calculate power.		
	50.05 Solve problems involving fluid power.		
	50.06 Construct a system to convert pneumatic power into mechanical power.		
51.0	Build, program, and configure a robot to perform predefined tasks. – The student will be able to:		
	51.01 Build a robot.		
	51.02 Create programs using robotic software that will allow the robot to perform a set of tasks.		
	51.03 Configure servo motors to operate the robot.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	51.04 Formulate a list of tasks in which the robot can be used in a large scale CIM cell operation.		
52.0	Demonstrate an understanding of the elements of Computer Integrated Manufacturing (CIM). – The student will be able to:		
	52.01 Identify the three categories of CIM systems.		
	52.02 Compare and contrast the benefits and drawbacks of the three categories of CIM systems.		
	52.03 Identify the components of an FMS.		
	52.04 Create a process design chart for a manufacturing process.		
	52.05 Students will explore a manufacturing or automation career of interest and determine the appropriateness and steps required to be a professional in that role.		
53.0	Demonstrate proficiency in designing an efficient flexible manufacturing system (FMS) that contains CIM elements. – The student will be able to:		
	53.01 Identify the potential safety issues with a CIM system and identify solutions for these problems.		
	53.02 Understand the significance of teamwork and communication.		
	53.03 Design a manufacturing system that contains at least two automated components.		
	53.04 Complete the construction of each individual component of the miniature FMS and verify that each component works.		
	53.05 Assemble components into a working miniature FMS.		
	53.06 Refine each component to improve the total process flow and cycle time.		
	53.07 Maintain a journal to document daily work.		

Florida Department of Education
Student Performance Standards

Course Title: **Civil Engineering and Architecture**
Course Number: **8600590**
Course Credit: **1**

Course Description:

This course provides an overview of the fields of Civil Engineering and Architecture, while emphasizing the interrelationship and dependence of both fields on each other. Students use state of the art software to solve real world problems and communicate solutions to hands-on projects and activities. This course covers topics such as the Roles of Civil Engineers and Architects, Project Planning, Site Planning, Building Design, and Project Documentation and Presentation.

Florida Standards			Correlation to CTE Program Standard #
36.0	Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Engineering Pathways.		
	36.01 Key Ideas and Details		
	36.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. LAFS.1112.RST.1.1	
	36.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.1112.RST.1.2	
	36.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.1112.RST.1.3	
	36.02 Craft and Structure		
	36.02.1	Determine the meaning of symbols key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. LAFS.1112.RST.2.4	
	36.02.2	Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. LAFS.1112.RST.2.5	

Florida Standards			Correlation to CTE Program Standard #
	36.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. LAFS.1112.RST.2.6	
36.03	Integration of Knowledge and Ideas		
	36.03.1	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g. quantitative data, video, multimedia) in order to address a question or solve a problem. LAFS.1112.RST.3.7	
	36.03.2	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. LAFS.1112.RST.3.8	
	36.03.3	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. LAFS.1112.RST.3.9	
36.04	Range of Reading and Level of Text Complexity		
	36.04.1	By the end of grade 11, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	36.04.2	By the end of grade 12, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 11–CCR text complexity band independently and proficiently. LAFS.1112.RST.4.10	
37.0	Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Engineering Pathways.		
37.01	Text Types and Purposes		
	37.01.1	Write arguments focused on discipline-specific content. LAFS.1112.WHST.1.1	
	37.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.1112.WHST.1.2	
37.02	Production and Distribution of Writing		

Florida Standards			Correlation to CTE Program Standard #
	37.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.1112.WHST.2.4	
	37.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.1112.WHST.2.5	
	37.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. LAFS.1112.WHST.2.6	
	37.03	Research to Build and Present Knowledge	
	37.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.1112.WHST.3.7	
	37.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. LAFS.1112.WHST.3.8	
	37.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.1112.WHST.3.9	
	37.04	Range of Writing	
	37.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.1112.WHST.4.10	
38.0	Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Engineering Pathways.		
	38.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	
	38.02	Reason abstractly and quantitatively. MAFS.K12.MP.2.1	

Florida Standards	Correlation to CTE Program Standard #
38.03 Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
38.04 Model with mathematics. MAFS.K12.MP.4.1	
38.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
38.06 Attend to precision. MAFS.K12.MP.6.1	
38.07 Look for and make use of structure. MAFS.K12.MP.7.1	
38.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
54.0 Demonstrate an understanding of civil engineering and architecture, its history, innovations, and evolution of styles and materials. – The student will be able to:		
54.01 Connect modern structural and architectural designs to historical architectural and civil engineering achievements.		
54.02 Identify three general categories of structural systems used in historical buildings.		
54.03 Explain how historical innovations have contributed to the evolution of civil engineering and architecture.		
54.04 Identify and explain the application of principles and elements of design to architectural buildings.		
54.05 Determine architectural style through identification of building features, components, and materials.		
54.06 Create a mock-up model depicting an architectural style or feature using a variety of materials. .		
55.0 Demonstrate an understanding of the civil engineering and architecture field. – The student will be able to:		
55.01 Identify the primary duties, and attributes of a civil engineer and an architect along with the traditional path for becoming a civil engineer or architect.		
55.02 Identify various specialty disciplines associated with civil engineering.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	55.03 Participate in a design charrette and recognize the value of using a charrette to develop innovative solutions to support whole building design.		
	55.04 Understand the relationship among the stakeholders involved in the design and construction of a building project.		
56.0	Demonstrate an understanding of residential building structure, elements of design, and associated processes. – The student will be able to:		
	56.01 Identify typical components of a residential framing system.		
	56.02 Recognize conventional residential roof designs.		
	56.03 Model a common residential roof design and detail advantages and disadvantages of that style.		
	56.04 Use 3D architectural software to create a small building.		
57.0	Perform mathematical operations associated with cost and efficiency analysis of a residential design. – The student will be able to:		
	57.01 Apply basic math skills to calculate the quantity and cost of concrete needed to pour the pad for a small building.		
	57.02 Create a cost estimate for a small construction project, including a detailed cost break-down.		
	57.03 Calculate the heat loss through one wall of a conditioned building.		
	57.04 Calculate the heat loss for a building envelope with given conditions appropriate for the project.		
	57.05 Apply principles of sustainable design to a small project.		
58.0	Demonstrate proficiency in designing a residential structure, ascertaining appropriateness of electrical and plumbing elements, and considering site constraints and applicable codes. – The student will be able to:		
	58.01 Apply elements of good residential design to the design of a basic house to meet the needs of a client.		
	58.02 Design a home design that complies with applicable codes and requirements.		
	58.03 Incorporate sustainable building principles and universal design concepts into a residential design.		
	58.04 Create bubble diagrams and sketch a floor plan.		
	58.05 Identify residential foundation types and choose an appropriate foundation for a residential application.		
	58.06 Calculate the head loss and estimate the water pressure for a given water supply system.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
58.07	Create sketches to document a preliminary plumbing and a preliminary electrical system layout for a residence that comply with applicable codes.		
58.08	Design an appropriate sewer lateral for wastewater management for a building that complies with applicable codes.		
58.09	Create a site opportunities map and sketch a project site.		
58.10	Choose an appropriate building location on a site based on orientation and other site-specific information.		
58.11	Calculate the storm water runoff from a site before and after development.		
58.12	Document the design of a home using 3D architectural design software and construction drawings.		
59.0	Demonstrate proficiency in designing commercial building structures, including compliance with building and zoning regulations, appropriate wall structures, and appropriate material selection. – The student will be able to:		
59.01	Identify applicable building codes and regulations that apply to a given development.		
59.02	Classify a building according to its use, occupancy, and construction type using the International Building Code.		
59.03	Research Land Use regulations to identify zoning designations and allowable uses of property.		
59.04	Comply with specifications, regulations, and codes during a design process.		
59.05	Compare a variety of commercial wall systems and select an appropriate system for a given commercial application based on materials, strength, aesthetics, durability, and cost.		
59.06	Compare a variety of commercial low-slope roof systems and select an appropriate system for a given commercial application based on materials, strength, durability, and cost.		
59.07	Incorporate sustainable building practices, especially a green roof, into the design of a commercial building.		
59.08	Use 3D architectural design software to incorporate revisions for the redesign of a building.		
59.09	Use 3D architectural design software to create appropriate documentation to communicate a commercial building design.		
59.10	Calculate the structural efficiency of a structure.		
59.11	Use load-span tables to design structural elements.		
60.0	Demonstrate proficiency in designing wall, floor, and foundation structures to meet specific load requirements using structural analysis software. – The student will be able to:		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
60.01	Identify the work of a structural engineer.		
60.02	Use building codes and other resources to calculate roof loading to a structure and select appropriate roof beams to safely carry the load.		
60.03	Analyze a simply supported beam subjected to a given loading condition to determine reaction forces, sketch shear and moment diagrams, and determine the maximum moment resulting in the beam.		
60.04	Use beam formula to calculate end reactions and the maximum moments of a simply supported beam subjected to a given loading condition.		
60.05	Use structural analysis software to create shear and moment diagrams of simply supported beams subjected to a given loading condition.		
60.06	Calculate the deflection of a simply supported beam subjected to a given loading condition.		
60.07	Use building codes and other resources to determine the required floor loading and design a structural steel floor framing system (beams and girders) for a given building occupancy.		
60.08	Identify and describe the typical usage of foundation systems commonly used in commercial construction.		
60.09	Determine the loads transferred from a steel framed structure to the ground through a foundation.		
60.10	Size a spread footing for a given loading condition.		
60.11	Check structural calculations created by others for correctness.		
61.0	Demonstrate proficiency in designing heating, ventilation, and air conditioning services and utilities for a commercial project to achieve energy conservation. – The student will be able to:		
61.01	Interpret and apply code requirements and constraints as they pertain to the installation of services and utilities.		
61.02	Read and understand HVAC construction drawings for a commercial project.		
61.03	Apply criteria and constraints to size and locate the new utility service connections for a commercial facility.		
61.04	Modify system designs to incorporate energy conservation techniques.		
62.0	Demonstrate proficiency in creating a commercial site design that considers soil characteristics, storm water runoff, and specification/code requirements. – The student will be able to:		
62.01	Use differential leveling to complete a control survey to establish a point of known elevation for a project.		
62.02	Design appropriate pedestrian access, vehicular access and a parking lot for a commercial facility.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
62.03	Analyze a site soil sample to determine the United Soil Classification System designation and predict soil characteristics important to the design and construction of a building on the site.		
62.04	Estimate the increase in storm water runoff from a commercial site and create a preliminary design for a storm water storage facility.		
62.05	Apply Low Impact Development techniques to a commercial site design reduce the impact of development on storm water runoff quantity and quality.		
62.06	Follow specifications and codes during a design process.		
62.07	Given 3D architectural design software, document a commercial site design.		
63.0	Design a commercial building. – The student will be able to:		
63.01	Work individually and in groups to produce a solution to a team project.		
63.02	Research codes, zoning ordinances and regulations to determine the applicable requirements for a project.		
63.03	Identify the boundaries of a property based on its legal description.		
63.04	Perform research and visit a site to gather information pertinent to the viability of a project on the site.		
63.05	Identify the criteria and constraints, and gather information to promote viable decisions regarding the development of their solution.		
63.06	Create an architectural program, a project organization chart, and a Gantt chart and hold project progress meetings to help manage the team project.		
63.07	Communicate ideas while developing a project using various drawing methods, sketches, graphics, or other media collected and documented.		
63.08	Investigate the legal, physical, and financial requirements of a project and consider the needs of the community to determine project viability.		
63.09	Apply current common practices utilized in Civil Engineering and Architecture to develop a viable solution in their project.		
63.10	Develop an understanding of how software is used as a tool to aid in the solution and then the communication of a project.		
64.0	Create and deliver a presentation of a commercial building design. – The student will be able to:		
64.01	Assemble and organize work from a commercial project to showcase the project in an effective and professional manner.		
64.02	Create visual aids for a presentation that include the appropriate drawings, renderings, models, documentation, and the rationale for choosing the proposal for project development.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
64.03	Conduct an oral presentation to present a proposal for the design and development of a commercial building project.		

Florida Department of Education
Student Performance Standards

Course Title: **Aerospace Engineering**
Course Number: **8600620**
Course Credit: **1**

Course Description:

This course is intended to engage students in analyzing and designing solutions to engineering design problems related to aerospace information systems, astronautics, rocketry, propulsion, the physics of space science, space life sciences, the biology of space science, principles of aeronautics, structures and materials, and systems engineering. Students work in teams, exploring hands-on projects and activities to learn the characteristics of aerospace engineering and work on major problems to be exposed to the various situations that aerospace engineers face in their careers.

Florida Standards			Correlation to CTE Program Standard #
36.0	Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Engineering Pathways.		
	36.01 Key Ideas and Details		
	36.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. LAFS.1112.RST.1.1	
	36.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.1112.RST.1.2	
	36.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.1112.RST.1.3	
	36.02 Craft and Structure		
	36.02.1	Determine the meaning of symbols key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. LAFS.1112.RST.2.4	
	36.02.2	Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. LAFS.1112.RST.2.5	

Florida Standards			Correlation to CTE Program Standard #
	36.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. LAFS.1112.RST.2.6	
36.03	Integration of Knowledge and Ideas		
	36.03.1	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g. quantitative data, video, multimedia) in order to address a question or solve a problem. LAFS.1112.RST.3.7	
	36.03.2	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. LAFS.1112.RST.3.8	
	36.03.3	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. LAFS.1112.RST.3.9	
36.04	Range of Reading and Level of Text Complexity		
	36.04.1	By the end of grade 11, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	36.04.2	By the end of grade 12, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 11–CCR text complexity band independently and proficiently. LAFS.1112.RST.4.10	
37.0	Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Engineering Pathways.		
37.01	Text Types and Purposes		
	37.01.1	Write arguments focused on discipline-specific content. LAFS.1112.WHST.1.1	
	37.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.1112.WHST.1.2	
37.02	Production and Distribution of Writing		

Florida Standards			Correlation to CTE Program Standard #
	37.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.1112.WHST.2.4	
	37.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.1112.WHST.2.5	
	37.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. LAFS.1112.WHST.2.6	
	37.03	Research to Build and Present Knowledge	
	37.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.1112.WHST.3.7	
	37.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. LAFS.1112.WHST.3.8	
	37.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.1112.WHST.3.9	
	37.04	Range of Writing	
	37.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.1112.WHST.4.10	
38.0	Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Engineering Pathways.		
	38.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	
	38.02	Reason abstractly and quantitatively. MAFS.K12.MP.2.1	

Florida Standards	Correlation to CTE Program Standard #
38.03 Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
38.04 Model with mathematics. MAFS.K12.MP.4.1	
38.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
38.06 Attend to precision. MAFS.K12.MP.6.1	
38.07 Look for and make use of structure. MAFS.K12.MP.7.1	
38.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
65.0 Demonstrate an understanding of the foundations of flight. – The student will be able to:		
65.01 Describe the main components of an aircraft and the forces acting on them.		
65.02 Explain and compare the impact of design changes on aircraft performance.		
65.03 Describe the factors affecting aircraft performance in flight.		
65.04 Analyze the design of an airfoil using simulation software and identify the design changes needed to meet specifications.		
65.05 Design and test an airfoil to meet specifications using simulation software.		
65.06 Construct an airfoil from a designed template.		
65.07 Perform a wind tunnel test of a designed airfoil.		
66.0 Demonstrate an understanding of aerodynamics fundamentals and aerodynamic testing. – The student will be able to:		
66.01 Synthesize a test plan for performance analysis of an airfoil.		
66.02 Analyze performance data from a wind tunnel test.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	66.03 Create and present a technical report of the wind tunnel test results.		
67.0	Demonstrate an understanding of propulsion systems and their performance factors. – The student will be able to:		
	67.01 Relate Newton's Three Laws of Motion to propulsion.		
	67.02 Describe the main forms of propulsion.		
	67.03 Analyze and compare performance of the different forms of propulsion.		
	67.04 Design and test an engine or propulsion system using simulation software.		
68.0	Demonstrate an understanding of propulsionless flight. – The student will be able to:		
	68.01 Describe the requirements for a glider to be stable in flight.		
	68.02 Analyze the design of a glider and identify the design changes needed to meet specifications using simulation software.		
	68.03 Design and construct a glider to meet specifications.		
	68.04 Evaluate glider design relative to performance.		
	68.05 Write a proposal to receive "funding" to revise the current design.		
69.0	Demonstrate an understanding of technologies used in aerial navigation. – The student will be able to:		
	69.01 Measure the GPS location of a number of objects.		
	69.02 Create a navigational chart.		
	69.03 Create a multi-segment flight plan.		
	69.04 Compare textual versus visual information relative to situational awareness.		
	69.05 Describe technological advances in the Global Positioning System.		
70.0	Demonstrate an understanding of rocketry and associated performance factors. – The student will be able to:		
	70.01 Design and build a rocket engine thrust test device.		
	70.02 Test the thrust of a rocket engine using an engine thrust test device.		
	70.03 Modify the test to show thrust versus time data.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	70.04 Describe the design factors and forces impacting rocket flight and how they interact using simulation software.		
	70.05 Describe how changes in design characteristics affect rocket performance.		
	70.06 Work as an engineering team to construct, fly, and create a formal report on a model rocket.		
	70.07 Estimate the maximum altitude of a model rocket.		
	70.08 Calculate a rocket's maximum acceleration and velocity.		
	70.09 Describe how lift, drag, thrust, and weight are affected by launch angle.		
71.0	Demonstrate an understanding of rocket/satellite-based aerial photography. – The student will be able to:		
	71.01 Design and construct an aerial photography project.		
	71.02 Calculate the scale factor of aerial photographs.		
	71.03 Calculate rocket altitude using the scale factor of an aerial photograph.		
72.0	Demonstrate an understanding of orbital mechanics. – The student will be able to:		
	72.01 Describe a conic section and explain its relation to orbital theory.		
	72.02 Describe the orbital parameters associated with earth satellite motion.		
73.0	Demonstrate an understanding of gravity and its effects on the human body. – The student will be able to:		
	73.01 Describe g-force and explain its relationship to gravity.		
	73.02 Design and conduct a g-force experiment, synthesizing the collected data to real world situations.		
	73.03 Describe vestibular stimulation and explain its effects in reduced gravity environments.		
	73.04 Describe microgravity and its importance to space flight environments.		
74.0	Demonstrate an understanding of composite materials and their fabrication. – The student will be able to:		
	74.01 Mold various composite materials into test samples.		
	74.02 Conduct deflection tests on various test samples and graph the results.		
	74.03 Describe the role of composite materials in aircraft and spacecraft construction.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
75.0	Demonstrate an understanding of thermal protection systems. – The student will be able to:		
75.01	Identify the material properties necessary to provide thermal protection.		
75.02	Conduct a thermal test on various materials, evaluate the results, and select the best candidate material.		
76.0	Demonstrate an understanding of intelligent vehicles. – The student will be able to:		
76.01	Describe the role of robotics in space environments.		
76.02	Design a computer-controlled robot to deliver a payload to a location by navigating an obstacle course.		
76.03	Design, build, and test an intelligent vehicle to meet specifications and pre-defined criteria.		

Florida Department of Education
Student Performance Standards

Course Title: **Biotechnical Engineering**
Course Number: **8600630**
Course Credit: **1**

Course Description:

This course is intended to expose students to the diverse fields of biotechnology including biomedical engineering, bio-molecular genetics, bioprocess engineering, and agricultural and environmental engineering. Students will be engaged in engineering design problems related to biomechanics, cardiovascular engineering, genetic engineering, agricultural biotechnology, tissue engineering, biomedical devices, human interface, bioprocesses, forensics, and bio-ethics. This course applies and concurrently develops secondary level knowledge and skills in biology, physics, technology, and mathematics.

Florida Standards			Correlation to CTE Program Standard #
36.0	Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Engineering Pathways.		
	36.01 Key Ideas and Details		
	36.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. LAFS.1112.RST.1.1	
	36.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.1112.RST.1.2	
	36.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.1112.RST.1.3	
	36.02 Craft and Structure		
	36.02.1	Determine the meaning of symbols key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. LAFS.1112.RST.2.4	
	36.02.2	Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. LAFS.1112.RST.2.5	

Florida Standards			Correlation to CTE Program Standard #
	36.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. LAFS.1112.RST.2.6	
36.03	Integration of Knowledge and Ideas		
	36.03.1	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g. quantitative data, video, multimedia) in order to address a question or solve a problem. LAFS.1112.RST.3.7	
	36.03.2	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. LAFS.1112.RST.3.8	
	36.03.3	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. LAFS.1112.RST.3.9	
36.04	Range of Reading and Level of Text Complexity		
	36.04.1	By the end of grade 11, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	36.04.2	By the end of grade 12, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 11–CCR text complexity band independently and proficiently. LAFS.1112.RST.4.10	
37.0	Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Engineering Pathways.		
37.01	Text Types and Purposes		
	37.01.1	Write arguments focused on discipline-specific content. LAFS.1112.WHST.1.1	
	37.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.1112.WHST.1.2	
37.02	Production and Distribution of Writing		

Florida Standards			Correlation to CTE Program Standard #
	37.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.1112.WHST.2.4	
	37.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.1112.WHST.2.5	
	37.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. LAFS.1112.WHST.2.6	
	37.03	Research to Build and Present Knowledge	
	37.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.1112.WHST.3.7	
	37.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. LAFS.1112.WHST.3.8	
	37.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.1112.WHST.3.9	
	37.04	Range of Writing	
	37.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.1112.WHST.4.10	
38.0	Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Engineering Pathways.		
	38.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	
	38.02	Reason abstractly and quantitatively. MAFS.K12.MP.2.1	

Florida Standards	Correlation to CTE Program Standard #
38.03 Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
38.04 Model with mathematics. MAFS.K12.MP.4.1	
38.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
38.06 Attend to precision. MAFS.K12.MP.6.1	
38.07 Look for and make use of structure. MAFS.K12.MP.7.1	
38.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
77.0	Demonstrate an understanding of documentation procedures associated with biotechnical engineering. – The student will be able to:		
77.01	Describe the various methods of documentation in biotechnical engineering.		
77.02	Compare and contract various methods of information gathering.		
77.03	Follow procedures for ensuring accuracy and precision in measuring solutions.		
78.0	Demonstrate an understanding of the evolution of biotechnical engineering. – The student will be able to:		
78.01	Research and create a timeline depicting the evolution of biotechnical engineering, describing the impact of individual milestones.		
78.02	Describe the fundamental concepts common to all major industries in biotechnical engineering.		
78.03	Explain how biotechnical engineered products impact society.		
78.04	Describe the relationship between the financial markets and biotechnical engineering.		
79.0	Demonstrate an understanding of the role of values, morals, and ethics in the field of biotechnology. – The student will be able to:		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	79.01 Differentiate among values, morals, and ethics.		
	79.02 Analyze the bioethical issues arising from options created by technological advancements.		
	79.03 Create a public opinion survey.		
80.0	Demonstrate an understanding of the roles of forensics, reverse engineering, and genetic engineering to biotechnology applications. – The student will be able to:		
	80.01 Describe molecular techniques used by bioinformaticists.		
	80.02 Analyze and apply the technologies used in the field of forensics.		
	80.03 Reverse engineer a crime scene.		
	80.04 Evaluate evidence and justify conclusions.		
	80.05 Apply practical knowledge of genetic engineering.		
	80.06 Form a start-up company that expands on previous genetic engineering work.		
	80.07 Conduct facial reconstruction as would a forensic artist.		
81.0	Demonstrate an understanding of fermentation as it relates to the production of renewable energy. – The student will be able to:		
	81.01 Design a method or instrument for measuring fermentation rate.		
	81.02 Research and determine ideal conditions for fermentation.		
	81.03 Design and run a yeast-powered vehicle.		
82.0	Demonstrate an understanding of engineering design principles relative to the field of biotechnology. – The student will be able to:		
	82.01 Apply engineering design principles by improving the design of a hospital or surgical instrument.		
	82.02 Demonstrate the application of product liability, product reliability, product reusability, and product failure.		
83.0	Demonstrate an understanding of engineering as it relates to the design of prosthetic devices. – The student will be able to:		
	83.01 Design and build a joint model that mirrors human movement.		
	83.02 Design and model a new joint replacement.		
	83.03 Synthesize skeletal system concepts with the design process for engineering joints.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
84.0	Research heart diseases, disorders, treatment options, and procedures. – The student will be able to:		
84.01	Sketch and provide a solid model of heart chambers and valves.		
84.02	Research procedures involving artificial heart surgery and present the cost of a proposed noninvasive implant.		
84.03	Research and create a set of improvements for imaging techniques.		
84.04	Design a portable ECG monitor and study the electrical aspects associated with the heart.		
84.05	Research and design improvements in heart implants or instruments.		
84.06	Perform a virtual heart surgery to better understand the instruments and implants in need of improving.		

Florida Department of Education
Student Performance Standards

Course Title: **Engineering Design and Development**
Course Number: **8600650**
Course Credit: **1**

Course Description:

The purpose of this course is to serve as a capstone course to provide students with the opportunity to develop a solution to a design problem from start to finish. Students work in teams to design, engineer, create a prototype, perform product testing, and then produce a finished product. This would involve using ALL of the knowledge previously learned, not only in technology education, but across the curriculum. Students will be expected to create and deliver a formal report on the project.

Florida Standards			Correlation to CTE Program Standard #
36.0	Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Engineering Pathways.		
	36.01 Key Ideas and Details		
	36.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. LAFS.1112.RST.1.1	
	36.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.1112.RST.1.2	
	36.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.1112.RST.1.3	
	36.02 Craft and Structure		
	36.02.1	Determine the meaning of symbols key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. LAFS.1112.RST.2.4	
	36.02.2	Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. LAFS.1112.RST.2.5	

Florida Standards			Correlation to CTE Program Standard #
	36.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. LAFS.1112.RST.2.6	
36.03	Integration of Knowledge and Ideas		
	36.03.1	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g. quantitative data, video, multimedia) in order to address a question or solve a problem. LAFS.1112.RST.3.7	
	36.03.2	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. LAFS.1112.RST.3.8	
	36.03.3	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. LAFS.1112.RST.3.9	
36.04	Range of Reading and Level of Text Complexity		
	36.04.1	By the end of grade 11, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	36.04.2	By the end of grade 12, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 11–CCR text complexity band independently and proficiently. LAFS.1112.RST.4.10	
37.0	Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Engineering Pathways.		
37.01	Text Types and Purposes		
	37.01.1	Write arguments focused on discipline-specific content. LAFS.1112.WHST.1.1	
	37.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.1112.WHST.1.2	
37.02	Production and Distribution of Writing		

Florida Standards			Correlation to CTE Program Standard #
	37.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.1112.WHST.2.4	
	37.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.1112.WHST.2.5	
	37.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. LAFS.1112.WHST.2.6	
	37.03	Research to Build and Present Knowledge	
	37.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.1112.WHST.3.7	
	37.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. LAFS.1112.WHST.3.8	
	37.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.1112.WHST.3.9	
	37.04	Range of Writing	
	37.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.1112.WHST.4.10	
38.0	Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Engineering Pathways.		
	38.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	
	38.02	Reason abstractly and quantitatively. MAFS.K12.MP.2.1	

Florida Standards	Correlation to CTE Program Standard #
38.03 Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
38.04 Model with mathematics. MAFS.K12.MP.4.1	
38.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
38.06 Attend to precision. MAFS.K12.MP.6.1	
38.07 Look for and make use of structure. MAFS.K12.MP.7.1	
38.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
85.0 Identify, define, and justify a technical design problem for resolution. – The student will be able to:		
85.01 Brainstorm problem statements for unique innovations or inventions.		
85.02 Write a concise problem statement using technical writing skills.		
85.03 Document research that justifies using the problem statement for the engineering design and development project.		
86.0 Conduct research and investigation into the stated problem. – The student will be able to:		
86.01 Use a list of specifications and constraints identified in a decision matrix to develop a list of alternative solutions to the stated problem.		
86.02 Research and identify patents related to their identified problem.		
86.03 Conduct research to investigate and determine the merit of his or her alternative solution based on past solutions to the problem.		
86.04 Explain the feasibility of his or her solution based on his or her research.		
86.05 Develop research strategies for his or her solution, including the use of surveys, phone interviews, and personal contact with experts related to the field of his or her technical problem.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
86.06	Create a matrix table to analyze the data found from the patent research.		
86.07	Conduct research to identify the difference between innovation and invention.		
86.08	Write a fictional scenario for an innovation of interest.		
86.09	Discuss the pros and cons of a decision matrix.		
86.10	Conduct research and perform a trend analysis on a technical problem.		
86.11	Sketch one invention and one innovation related to the technical problem.		
87.0	Perform and graphically represent an evaluation of proposed design solutions using specific criteria, including product specifications. – The student will be able to:		
87.01	Create a description of the product specifications for the design solution.		
87.02	Objectively evaluate proposed design solutions using specific criteria.		
87.03	Select the best design solution option using a decision matrix.		
87.04	Graphically represent the results of the design solution evaluation.		
88.0	Design a solution to the problem and create a working prototype for testing. – The student will be able to:		
88.01	Sketch all parts of their design solution including an isometric view of the assembled product.		
88.02	Create a set of working drawings for their design solution.		
88.03	Interpret and apply the feedback they receive from experts to improve their design solution.		
88.04	Refine their design solution, if necessary, based upon expert feedback.		
88.05	Document the project's progress in their engineering notebooks.		
88.06	Prototype		
88.07	Identify safe practices for the use of tools and equipment.		
88.08	Create a detailed set of instructions for producing a testable prototype based on the information gained through their research.		
88.09	Identify methods and sources for obtaining materials and supplies.		
88.10	Compile a materials list that includes vendors and cost for all necessary materials and equipment to build their prototype.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	88.11 Write a step-by-step procedure for the assembly of their prototype.		
	88.12 Build a working prototype that can be tested.		
89.0	Evaluate and select appropriate testing methodologies for testing the product, conduct product testing, refine the design as needed, and document the process and results. – The student will be able to:		
	89.01 Select and describe a valid testing method that will be used to accurately evaluate their design solution's ability to solve their problem.		
	89.02 Prepare a description of the testing method that will be used to valid the designed solution.		
	89.03 Create a valid justification for the selected testing method.		
	89.04 Devise a list of testing criteria that will be used to evaluate the success or failure of their prototype testing		
	89.05 Identify, define, and implement needed modifications to their testing method based on expert feedback and their ongoing research.		
	89.06 Document their project's progress in their engineer's notebook.		
	89.07 Create a detailed set of instructions for testing the prototype that will be valid, repeatable, and reliable.		
	89.08 Apply the appropriate statistical analysis tools to the test results to ensure validity.		
	89.09 Identify, define, and implement necessary modifications to their design based upon their test results.		
	89.10 Identify how their solution has removed obsolescence of the original product, if appropriate.		
	89.11 Evaluate and explain the effectiveness of their design at solving the problem they have defined.		
	89.12 Document the test results and project progress in their engineering notebooks.		
90.0	Create and deliver a formal presentation in a suitable form of the solution to the problem. – The student will be able to:		
	90.01 Gather data and information compiled throughout the project and create a technical research paper, PowerPoint, and three panel display of the design solution.		
	90.02 Create a website, if appropriate, in order to depict all aspects of the design solution.		
	90.03 Choose one of the formats used to depict the design solution, such as technical research paper, PowerPoint, three panel display, or website, if created, for the presentation of the solution to the problem.		
	90.04 Orally present an effective technical presentation on the design solution.		

Additional Information

Laboratory Activities

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

Career and Technical Student Organization (CTSO)

The Florida Technology Student Association (FL-TSA) is the intercurricular career and technical student organization for providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

Cooperative Training – OJT

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

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 Occupational Completion Point (OCP) or a Modified Occupational Completion Point (MOCP). If needed, a student may enroll in the same career and technical course more than once. Documentation should be included in the IEP that clearly indicates that it is anticipated that the student may need an additional year to complete an OCP/MOCP. The student should work on different competencies and new applications of competencies each year toward completion of the OCP/MOCP. After achieving the competencies identified for the year, the student earns credit for the course. It is important to ensure that credits earned by students are reported accurately. The district's information system must be designed to accept multiple credits for the same course number for eligible students with disabilities.

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

Florida Department of Education
Curriculum Framework

Program Title: **Applied Robotics**
Program Type: **Non Career Preparatory**
Career Cluster: **Engineering & Technology Education**

Secondary – Non Career Preparatory	
Program Number	9410100
CIP Number	0615030330
Grade Level	9-12; 30, 31
Standard Length	4 credits
Teacher Certification	TEC ED 1 @2 ENG @7 7G ROBOTICS 7G
CTSO	Florida Technology Student Association (FL-TSA)
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 the principles and applications of robotics 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 science and mathematics knowledge, technological tools, machines, instruments, materials, processes and systems related to robotics.

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. Listed below are the courses that comprise this program. It is recommended that students complete or be concurrently enrolled in advanced science (physics) and mathematics courses (e.g., trigonometry, calculus).

Course Number	Course Title	Length	Level	Graduation Requirement
9410110	Foundations of Robotics	1 credit	3	VO
9410120	Robotic Design Essentials	1 credit	3	VO
9410130	Robotic Systems	1 credit	3	VO
9410140*	Robotic Applications Capstone	1 credit	3	VO

(Graduation Requirement Abbreviations- EQ= Equally Rigorous Science, PA= Practical Arts, EC= Economics, VO= Career and Technical Education)

** Note: This course is intended to serve as a capstone course.*

Academic Alignment

Academic alignment is an ongoing, collaborative effort of professional educators specializing in the fields of science, mathematics, English/language arts, and Career and Technical Education (CTE). This initiative supports CTE programs by improving student performance through the integration of academic content within CTE courses. Career and Technical Education courses that have been aligned to the Next Generation Sunshine State Standards for Science and the Florida Standards for Mathematics and English/Language Arts will show the following data: the quantity of academic standards in the CTE course; the total number of standards contained in the academic course; and the percentage of alignment to the CTE course.

Courses	Anatomy/ Physiology Honors	Astronomy Solar/Galactic Honors	Biology 1	Chemistry 1	Earth-Space Science	Environmental Science	Genetics	Integrated Science	Marine Science 1 Honors	Physical Science	Physics 1
9410110	3/87 3%	21/80 26%	11/83 13%	15/69 22%	14/67 21%	13/70 19%	6/69 9%	17/82 21%	15/66 23%	26/74 35%	23/72 32%
9410120	1/87 1%	10/80 13%	6/83 7%	7/69 10%	11/67 16%	5/70 7%	2/69 3%	11/82 13%	6/66 9%	16/74 22%	13/72 18%
9410130	4/87 5%	12/80 15%	1/83 1%	6/69 9%	7/67 10%	5/70 7%	5/69 7%	5/82 6%	5/66 8%	8/74 11%	11/72 15%
9410140	3/87 3%	3/80 4%	#	3/69 4%	#	3/70 4%	3/69 4%	#	3/66 5%	#	3/72 4%

*** Alignment pending review* *# Alignment attempted, but no correlation to academic course*

Courses	Algebra 1	Algebra 2	Geometry	English 1	English 2	English 3	English 4
9410110	12/67 18%	6/75 8%	3/54 6%	12/46 26%	12/45 27%	#	#
9410120	5/67 7%	2/75 3%	5/54 9%	14/46 30%	14/45 31%	#	#
9410130	1/67 6%	3/75 4%	#	#	#	10/45 22%	10/45 22%

Courses	Algebra 1	Algebra 2	Geometry	English 1	English 2	English 3	English 4
9410140	#	2/75 3%	#	#	#	8/45 18%	8/45 18%

** *Alignment pending review* # *Alignment attempted, but no correlation to academic course*

Florida Standards for Technical Subjects

Florida Standards (FS) for English Language Arts and Literacy in History/Social Studies, Science, and Technical Subjects are the critical reading and writing literacy standards designed for grade 6 and above. These standards are predicated on teachers of history/social studies, science, and technical subjects using their content area expertise to help students meet the particular challenges of reading, writing, speaking, listening, and language in their respective fields. It is important to note that the 6-12 literacy standards in history/social studies, science, and technical subjects are not meant to replace content standards in those areas but rather to supplement them.

This curriculum framework incorporates the grades 9-10 reading and writing literacy standards in the first two courses of this CTE program and grade 11-12 reading and writing literacy standards in the third and fourth courses of this CTE program. The standards for Mathematical Practices describe varieties of expertise that educators at all levels should seek to develop in their students. These practices rest on important "processes and proficiencies" with longstanding importance in mathematics education. This curriculum framework incorporates the appropriate mathematical practices in the first four courses of this CTE program.

Common Career Technical Core – Career Ready Practices

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

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

2. Apply appropriate academic and technical skills.

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

4. Communicate clearly, effectively and with reason.

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

6. Demonstrate creativity and innovation.

7. Employ valid and reliable research strategies.

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

9. Model integrity, ethical leadership and effective management.

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

11. Use technology to enhance productivity.

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

Standards

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

01.0 Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Applied Robotics.
02.0 Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Applied Robotics.
03.0 Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Applied Robotics.
04.0 Demonstrate an understanding of robotics, its history, applications, and evolution.
05.0 Describe Artificial Intelligence (AI) and the forms of applied logic.
06.0 Describe the role of sensors in the field of robotics.
07.0 Demonstrate an understanding of the foundations of electronics.
08.0 Describe the operation of basic electronic devices used in robotics.
09.0 Demonstrate an understanding of engineering principles.
10.0 Explain fundamental physics concepts applicable to the field of robotics.
11.0 Demonstrate the safe and proper use of electronic and other lab equipment, tools, and materials.
12.0 Build, program, and configure a robot to perform predefined tasks.
13.0 Solve problems using critical thinking skills, creativity and innovation.
14.0 Correlate elements of artificial intelligence to their functions in robotics.
15.0 Describe the various classification schemes of sensors applicable to robotics.
16.0 Explain how electronic devices are used in the operation of a robotic assembly.
17.0 Demonstrate an understanding of various technologies used in the design of robotic assemblies.
18.0 Demonstrate an understanding of advanced mathematics and physics associated with the design of a robotic assembly.
19.0 Create a program to control a robotic mechanism.
20.0 Describe the operation and use of various forms of electrical motors in robotic assemblies.
21.0 Solve problems using critical thinking skills, creativity and innovation.
22.0 Demonstrate an understanding of basic 3D modeling concepts.
23.0 Design, build, program, and configure a robot to perform predefined tasks.
24.0 Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Applied Robotics.
25.0 Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Applied Robotics.
26.0 Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Applied Robotics.
27.0 Describe the approaches, challenges, and problem-solving methodologies involved with integrating artificial intelligence into robotic systems.
28.0 Describe the role of specialized sensors in the design and operation of robotic systems.
29.0 Describe the use of specialized electronic applications used in robotic systems.
30.0 Demonstrate an understanding of engineering technologies impacted by the evolution of robotics.
31.0 Demonstrate an understanding of underlying principles of environmental physics related to robotic technology.
32.0 Demonstrate an understanding of the impact of robotics on the manufacturing process.
33.0 Demonstrate an understanding of topographical and environmental considerations in robotic assembly design.
34.0 Create a program to control a robotic system.
35.0 Demonstrate an understanding of technologies for communication with and among robotic systems.
36.0 Solve problems using critical thinking skills, creativity and innovation.

37.0 Demonstrate an understanding of static and dynamic modeling and simulation concepts related to the design of robotic systems.
38.0 Design, build, program, and configure a robot to perform predefined tasks.
39.0 Demonstrate an understanding of robotic applications (both stationary and mobile), their environments, and their unique design constraints.
40.0 Design, build, program, and configure an autonomous robot to perform predefined tasks suitable for a particular robotic application.
41.0 Successfully work as a member of a team.
42.0 Plan, organize, and carry out a project plan.
43.0 Manage resources.
44.0 Use tools, materials, and processes in an appropriate and safe manner.

Florida Department of Education
Student Performance Standards

Course Title: **Foundations of Robotics**
Course Number: **9410110**
Course Credit: **1**

Course Description:
This course provides students with a foundation in content and skills associated with robotics and automation, including artificial intelligence, electronics, physics, and principles of engineering.

Florida Standards			Correlation to CTE Program Standard #
01.0	Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Applied Robotics.		
	01.01 Key Ideas and Details		
	01.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. LAFS.910.RST.1.1	
	01.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.910.RST.1.2	
	01.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.910.RST.1.3	
	01.02 Craft and Structure		
	01.02.1	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. LAFS.910.RST.2.4	
	01.02.2	Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). LAFS.910.RST.2.5	
	01.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. LAFS.910.RST.2.6	

Florida Standards			Correlation to CTE Program Standard #
01.03	Integration of Knowledge and Ideas		
	01.03.1	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. LAFS.910.RST.3.7	
	01.03.2	Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. LAFS.910.RST.3.8	
	01.03.3	Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. LAFS.910.RST.3.9	
01.04	Range of Reading and Level of Text Complexity		
	01.04.1	By the end of grade 9, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	01.04.2	By the end of grade 10, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 9–10 text complexity band independently and proficiently. LAFS.910.RST.4.10	
02.0	Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Applied Robotics.		
02.01	Text Types and Purposes		
	02.01.1	Write arguments focused on discipline-specific content. LAFS.910.WHST.1.1	
	02.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.910.WHST.1.2	
02.02	Production and Distribution of Writing		
	02.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.910.WHST.2.4	
	02.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.910.WHST.2.5	

Florida Standards			Correlation to CTE Program Standard #
	02.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. LAFS.910.WHST.2.6	
02.03	Research to Build and Present Knowledge		
	02.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.910.WHST.3.7	
	02.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. LAFS.910.WHST.3.8	
	02.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.910.WHST.3.9	
02.04	Range of Writing		
	02.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.910.WHST.4.10	
03.0	Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Applied Robotics.		
03.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1		
03.02	Reason abstractly and quantitatively. MAFS.K12.MP.2.1		
03.03	Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1		
03.04	Model with mathematics. MAFS.K12.MP.4.1		
03.05	Use appropriate tools strategically. MAFS.K12.MP.5.1		

Florida Standards	Correlation to CTE Program Standard #
03.06 Attend to precision. MAFS.K12.MP.6.1	
03.07 Look for and make use of structure. MAFS.K12.MP.7.1	
03.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
04.0 Demonstrate an understanding of robotics, its history, applications, and evolution. – The student will be able to:		SC.912.E.5.7 SC.912.N.1.1, 2, 5, 6, 7; 2.1, 2 , 3, 4, 5; 3.2; 4.1
04.01 Explore robotics history through research of the industry.	LAFS.910.W.3.7, 8	
04.02 Compare and contrast various applications of automation and robotics.	LAFS.910.RI.1.3	
04.03 Describe emerging technologies and their implications on the field of robotics.	LAFS.910.W.3.7, 8 LAFS.910.RI.1.3	
05.0 Describe Artificial Intelligence (AI) and the forms of applied logic. – The student will be able to:		SC.912.N.1.3
05.01 Describe the fundamental elements that comprise artificial intelligence.	LAFS.910.L.3.4, 6	
05.02 Compare and contrast the various types of AI in terms of their application to robotics.	LAFS.910.RI.1.3	
05.03 Describe the role of decision logic in robotics.		
05.04 Describe Boolean logic, its operations and laws, as used in robotics.		
05.05 Translate data specifications into truth tables and extract logical expressions.	MAFS.912.N-Q.1.1	
05.06 Solve simple Boolean algebra problems.	MAFS.912.N-RN.2.3	
06.0 Describe the role of sensors in the field of robotics. – The student will be able to:		SC.912.P.10.1, 18, 21
06.01 Define sensor.	LAFS.910.L.3.4, 6	
06.02 Describe the basic operation common to all sensors.	LAFS.910.L.3.4, 6	

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	06.03 Describe the types of sensors and ways in which they can be categorized.		
	06.04 Describe tactile sensors, their operation, and their role in robotics.		
	06.05 Describe infrared sensors and their role in robotics.		
	06.06 Differentiate between active and passive infrared sensors relative to their use in robotics.		
07.0	Demonstrate an understanding of the foundations of electronics. – The student will be able to:		SC.912.N.3.5 SC.912.P.10.15, 17, 18
	07.01 Define voltage, current, resistance, inductance, and capacitance.	LAFS.910.L.3.4, 6	
	07.02 Describe the difference between alternating and direct current.	LAFS.910.L.3.4, 6	
	07.03 Identify and describe the operation of common electronic components.		
	07.04 Compare and contrast series and parallel circuits.		
	07.05 Define Ohm's Law and Kirchhoff's Laws.	LAFS.910.L.3.4, 6 MAFS.912.A-SSE.1.1, 2 MAFS.912.A-CED.1.4	
	07.06 Perform basic soldering techniques and breadboard construction.		
	07.07 Analyze simple analog and digital circuits using common electronic test equipment and tools.		
	07.08 Describe the characteristics of analog and digital signals.	LAFS.910.L.3.4, 6	
	07.09 Translate logical expressions into schematic or symbolic representation.	MAFS.912.N-CN.3.8	
08.0	Describe the operation of basic electronic devices used in robotics. – The student will be able to:		SC.912.P.10.3, 15
	08.01 Describe how DC motors are used in robotics.	LAFS.910.L.3.4, 6	
	08.02 Describe how speed and torque are controlled in DC motors.		
	08.03 Describe how servos are used in robotics (e.g., robot arms, legs, steering, et al).	LAFS.910.L.3.4, 6	
	08.04 Describe how angle and torque are controlled in a servo motor.		
	08.05 Compare and contrast open and closed loop feedback/control systems.		
09.0	Demonstrate an understanding of engineering principles. – The student will be able to:		SC.912.N.1.1, 2; 3.5 SC.912.P.10.3

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
09.01	Describe the steps involved in the engineering design process and the activities performed in each step.	LAFS.910.RI.1.3	
09.02	Create basic schematic drawings of electronic circuitry.	LAFS.910.W.1.2	
09.03	Name the six simple machines (i.e., lever, inclined plane, wheel and axle, screw, wedge, and pulley) and describe their application to robotics.		
09.04	Explain and demonstrate how gear ratios are used for increasing or decreasing power or speed.	LAFS.910.SL.2.4 MAFS.912.A-CED.1.1, 2	
09.05	Discuss Human Computer Interface (HCI) and describe its role in robotics.	LAFS.910.SL.1.1	
09.06	Describe the role of diagnostics and troubleshooting to the engineering design process.	LAFS.910.RI.1.3	
10.0	Explain fundamental physics concepts applicable to the field of robotics. – The student will be able to:		SC.912.P.8.3; 10.1, 2; 12.1, 3, 5
10.01	Describe Newton's Laws of Motion (inertia, net force, reaction) and relate their applicability to robotics.	LAFS.910.RI.1.1, 2	
10.02	Compare and contrast the forms of energy (e.g., thermal, solar, mechanical, kinetic, potential, et al.) employed in robotics.		
10.03	Relate the concept of time and rate to its application in robotics.		
10.04	Describe magnetics and its use and implications in robotics.	LAFS.910.L.3.4, 6 MAFS.912.A-REI.1.1	
10.05	Relate how material properties (e.g., mass, density, strength, et al) have applicability to robotics.		
11.0	Demonstrate the safe and proper use of electronic and other lab equipment, tools, and materials. – The student will be able to:		SC.912.L.17.20 SC.912.P.10.15, 20
11.01	Use a Volt-Ohm Meter (VOM)/multimeter to obtain accurate measurements of voltage, current, and resistance.		
11.02	Apply safety rules in the use of electronic instruments and demonstrate proper care and maintenance for the equipment during storage and use.		
11.03	Set up and use test equipment to observe waveforms and to determine the voltage of the signal presented.		
11.04	Use testers to determine the condition of electronic components.		
11.05	Demonstrate proper soldering applications.		
11.06	Identify and use common electrical and electronics hand tools.	LAFS.910.L.3.4, 6	

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
11.07	Follow laboratory safety rules and procedures.		
11.08	Demonstrate good housekeeping at workstation within total laboratory.		
11.09	Identify color-coding safety standards.		
11.10	Explain fire prevention and safety precautions and practices for extinguishing fires.	LAFS.910.SL.1.1	
11.11	Identify harmful effects/potential dangers of familiar hazardous substances/devices to people and the environment.		
12.0	Build, program, and configure a robot to perform predefined tasks. – The student will be able to:		SC.912.N.3.5; 4.2
12.01	Build a robot.		
12.02	Create programs as required using robotic software that will allow the robot to perform a set of tasks.	LAFS.910.L.3.6	
12.03	Create a flow chart that visually describes a basic robotic task.	LAFS.910.W.1.2	
12.04	Configure servo and motors to operate the robot.		
12.05	Formulate examples of how the robot might be used or adapted for use in a manufacturing or other environment.		
12.06	Create and present a proposal, including drawings and specifications, describing the robot, the tasks and rationale, and the results.	LAFS.910.SL.2.4, 5	
13.0	Solve problems using critical thinking skills, creativity and innovation. – The student will be able to:		SC.912.N.1.1, 2, 5, 6, 7; 2.1, 2, 3, 4, 5; 3.2; 4.1
13.01	Employ critical thinking skills independently and in teams to solve problems and make decisions.	LAFS.910.SL.1.1, 3 MAFS.912.A-REI.1.1; 2.3	
13.02	Employ critical thinking and interpersonal skills to resolve conflicts.		
13.03	Identify and document workplace performance goals and monitor progress toward those goals.		
13.04	Conduct technical research to gather information necessary for decision-making.	LAFS.910.W.3.7, 8	

Florida Department of Education
Student Performance Standards

Course Title: **Robotic Design Essentials**
Course Number: **9410120**
Course Credit: **1**

Course Description:
This course provides students with content and skills essential to the design and operation of robotics, including artificial intelligence, sensors, electronic devices, engineering technologies, motion physics, electrical motors, programming, simulation and modeling, and critical thinking skills.

Florida Standards			Correlation to CTE Program Standard #
01.0	Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Applied Robotics.		
	01.01 Key Ideas and Details		
	01.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. LAFS.910.RST.1.1	
	01.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.910.RST.1.2	
	01.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.910.RST.1.3	
	01.02 Craft and Structure		
	01.02.1	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. LAFS.910.RST.2.4	
	01.02.2	Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). LAFS.910.RST.2.5	
	01.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. LAFS.910.RST.2.6	

Florida Standards			Correlation to CTE Program Standard #
	01.03	Integration of Knowledge and Ideas	
	01.03.1	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. LAFS.910.RST.3.7	
	01.03.2	Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. LAFS.910.RST.3.8	
	01.03.3	Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. LAFS.910.RST.3.9	
	01.04	Range of Reading and Level of Text Complexity	
	01.04.1	By the end of grade 9, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	01.04.2	By the end of grade 10, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 9–10 text complexity band independently and proficiently. LAFS.910.RST.4.10	
02.0	Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Applied Robotics.		
	02.01	Text Types and Purposes	
	02.01.1	Write arguments focused on discipline-specific content. LAFS.910.WHST.1.1	
	02.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.910.WHST.1.2	
	02.02	Production and Distribution of Writing	
	02.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.910.WHST.2.4	
	02.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.910.WHST.2.5	

Florida Standards			Correlation to CTE Program Standard #
	02.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. LAFS.910.WHST.2.6	
02.03	Research to Build and Present Knowledge		
	02.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.910.WHST.3.7	
	02.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. LAFS.910.WHST.3.8	
	02.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.910.WHST.3.9	
02.04	Range of Writing		
	02.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.910.WHST.4.10	
03.0	Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Applied Robotics.		
03.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1		
03.02	Reason abstractly and quantitatively. MAFS.K12.MP.2.1		
03.03	Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1		
03.04	Model with mathematics. MAFS.K12.MP.4.1		
03.05	Use appropriate tools strategically. MAFS.K12.MP.5.1		

Florida Standards	Correlation to CTE Program Standard #
03.06 Attend to precision. MAFS.K12.MP.6.1	
03.07 Look for and make use of structure. MAFS.K12.MP.7.1	
03.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
14.0	Correlate elements of artificial intelligence to their functions in robotics. – The student will be able to:		SC.912.N.3.5 SC.912.P.12.2
14.01	Describe the types of sensor output required for various algorithms used in robotics.		
14.02	Formulate a schema (e.g. logic flow diagram.) for robotic control based on sensor data interpretation.	LAFS.910.W.1.2	
14.03	Explain how artificial intelligence and motion sequences are impacted by controlling sensor data and interpretation.	LAFS.910.SL.1.1	
14.04	Describe polymorphism and its implications on robotic algorithms.	LAFS.910.SL.2.4, 5	
14.05	Describe the design implications and options for sensor data and interpretation algorithms employed for autonomous robotic applications.	LAFS.910.SL.2.4, 5	
15.0	Describe the various classification schemes of sensors applicable to robotics. – The student will be able to:		SC.912.N.1.1, 6; 3.5 SC.912.P.10.1, 20, 21
15.01	Compare and contrast the characteristics, benefits, constraints, and cost implications of analog and digital sensors.	LAFS.910.SL.1.1	
15.02	Differentiate between passive and active sensors relative to their applicability and suitability for various robotic applications.		
15.03	Describe the various ways in which sensors are used in the design of robotic applications.	LAFS.910.SL.1.1	
16.0	Explain how electronic devices are used in the operation of a robotic assembly. – The student will be able to:		SC.912.N.3.5
16.01	Design and build breadboard or printed circuit boards for a robotic assembly.		
16.02	Describe the advantages, limitations, and operation of electronic control and feedback systems.	LAFS.910.L.3.4, 6	

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
16.03	Describe the operation and design considerations of electronic devices used to control robotic assemblies.	LAFS.910.L.3.4, 6	
16.04	Describe the kinds of electronic devices used as input/output devices in a robotic assembly and explain the rationale for their use.	LAFS.910.L.3.4, 6	
17.0	Demonstrate an understanding of various technologies used in the design of robotic assemblies. – The student will be able to:		SC.912.P.10.1, 3, 15
17.01	Describe the underlying principles associated with pneumatic and hydraulic devices used in the design of a robotic assembly.	LAFS.910.SL.2.4, 5	
17.02	Describe the underlying principles of electricity and electrical components, to include power sources, consumption, and heat issues.	LAFS.910.SL.2.4, 5	
17.03	Define various Human Computer Interface (HCI) issues that affect the design of a robotic assembly and elaborate on their role in the design.	LAFS.910.SL.2.4, 5	
17.04	Interpret information on mechanical and electrical diagrams according to the defined scale.	LAFS.910.RI.1.2	
17.05	Compare and contrast the operation, advantages, and constraints of wired and wireless strategies for communicating with robotic assemblies.		
17.06	Identify the design considerations associated with materials used in robotic assemblies and describe how the intended operational environment plays a role in the design.		
17.07	Compare and contrast the use of USB, firewire, Ethernet, serial cabling and wireless (Bluetooth, 802.11x) strategies and technologies in the design of robotic assemblies.	LAFS.910.SL.1.1	
18.0	Demonstrate an understanding of advanced mathematics and physics associated with the design of a robotic assembly. – The student will be able to:		SC.912.P.12.2, 3, 5, 6
18.01	Describe the concepts of acceleration and velocity as they relate to the kinematic design of robotic assemblies.	LAFS.910.SL.2.4, 5	
18.02	Describe the term “degrees of freedom” and relate it to the design of joints used in robotic assemblies.	LAFS.910.SL.2.4, 5	
18.03	Describe angular momentum and its role in the design of robotic joint motion, balance, and mobility.	LAFS.910.SL.2.4, 5	
18.04	Explain impulse-momentum theory and illustrate its applicability to the design of robotic assemblies.	LAFS.910.SL.1.1	
18.05	Explain translational, rotational, and oscillatory motion in terms of their applicability to the design of robotic assemblies.	LAFS.910.SL.1.1	
18.06	Describe the relationship between force and deformation as it relates to a robotic system.		
19.0	Create a program to control a robotic mechanism. – The student will be able to:		SC.912.N.1.1
19.01	Demonstrate an understanding of coding languages, syntax, and implementation.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
19.02	Apply programming best practices for commenting and documentation.		
19.03	Describe how logic is infused into a program and used to control the flow of the program.	LAFS.910.SL.1.1	
19.04	Write a program in pseudocode that uses structured programming to solve a problem.		
19.05	Write code for evaluating a condition and performing an appropriate action using If/then statements.		
19.06	Write code for performing actions within a code segment (using do/while statements) for as long as a given condition exists.		
19.07	Write code that loops through a series of actions for a specified increment.		
19.08	Write code that evaluates sensor data as variables to provide feedback control.		
20.0	Describe the operation and use of various forms of electrical motors in robotic assemblies. – The student will be able to:		SC.912.P.10.16; 12.5
20.01	Explain the operation and use of DC motors in robotic controls.	LAFS.910.SL.1.1	
20.02	Explain the operation and use of stepper motors to control or limit movement of a robotic assembly.	LAFS.910.SL.2.4, 5	
20.03	Explain the operation and primary use of AC motors in robotic assemblies.	LAFS.910.SL.1.1	
20.04	Explain the operation, use, and advantages of brushless motors used in robotics.	LAFS.910.SL.1.1	
20.05	Explain the types, use, and advantages of linear actuators used in robotics.	LAFS.910.SL.1.1	
21.0	Solve problems using critical thinking skills, creativity and innovation. – The student will be able to:		SC.912.N.1.1, 6, 7; 2.4
21.01	Employ critical thinking skills independently and in teams to solve problems and make decisions.	LAFS.910.SL.1.1, 3 MAFS.912.A-REI.1.1	
21.02	Employ critical thinking and interpersonal skills to resolve conflicts.	LAFS.910.SL.1.1, 3	
21.03	Identify and document workplace performance goals and monitor progress toward those goals.		
21.04	Conduct technical research to gather information necessary for decision-making.	LAFS.910.W.3.7, 8	
22.0	Demonstrate an understanding of basic 3D modeling concepts. – The student will be able to:		SC.912.N.3.5 SC.912.P.12.1
22.01	Compare and contrast 3D modeling software applications that offer a perspective view, an orthographic view, or a combination.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
22.02	Explain how Cartesian coordinate systems are used to locate objects in three dimensional space.	MAFS.912.A-REI.4.11 MAFS.912.G-CO.1.2	
22.03	Describe basic geometric shapes available in 3D modeling software (sphere, cube, cylinder, torus, cone, plane, axis point).	LAFS.910.SL.1.1 MAFS.912.G-GMD.2.4	
22.04	Describe basic shapes available in 2D modeling software (arcs, ellipses, circles, curve, freehand curves, polygons, splines).	LAFS.910.SL.1.1 MAFS.912.G-GMD.2.4	
22.05	Define the parameters used for determining the size, placement, and orientation of a modeling object.	LAFS.910.L.3.4, 6	
22.06	Describe the Boolean modeling operations of union, subtraction, and intersection.	LAFS.910.L.3.4, 6	
22.07	Describe how extrusion or sweeping techniques transform 2D objects into 3D objects.		
22.08	Describe the lofting technique for creating 3D objects.		
22.09	Describe the revolve or lathe techniques for animating a 2D object and give examples of their application.		
22.10	Describe the scale, rotate, and move actions that comprise the transformation technique for animating a 3D object.		
22.11	Describe the object parameters modified using the deformation technique and provide examples of its use.		
22.12	Describe the copy or clone technique.		
22.13	Describe the mirror technique.		
22.14	Compare and contrast the wire frame and solid viewing tools.		
22.15	Describe basic viewing navigation tools such as zoom, rotate, and panning.		
22.16	Define plug-in and describe how it extends the capability of the modeling program.		
22.17	Describe the export function and its value when producing visualizations.		
23.0	Design, build, program, and configure a robot to perform predefined tasks. – The student will be able to:		SC.912.N.1.1
23.01	Build a robot.		
23.02	Create programs as required using robotic software that will allow the robot to perform a set of tasks.		
23.03	Configure servo motors to operate the robot.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
23.04	Formulate examples of how the robot might be used or adapted for use in a manufacturing or other environment.		
23.05	Create a portfolio, including drawings and specifications, describing the robot, the tasks and rationale, and the results.	LAFS.910.W.1.2; 2.4, 5, 6; 4.10	

Florida Department of Education
Student Performance Standards

Course Title: **Robotic Systems**
Course Number: **9410130**
Course Credit: **1**

Course Description:
This course provides students with extended content and skills essential to the design and operation of robotic systems, including artificial intelligence, specialized sensors, electronic applications, engineering technologies, environmental physics, manufacturing, topographical considerations, programming, communications, simulation and modeling, and critical thinking skills.

Florida Standards			Correlation to CTE Program Standard #
24.0	Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Applied Robotics.		
	24.01 Key Ideas and Details		
	24.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. LAFS.1112.RST.1.1	
	24.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.1112.RST.1.2	
	24.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.1112.RST.1.3	
	24.02 Craft and Structure		
	24.02.1	Determine the meaning of symbols key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. LAFS.1112.RST.2.4	
	24.02.2	Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. LAFS.1112.RST.2.5	
	24.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. LAFS.1112.RST.2.6	

Florida Standards			Correlation to CTE Program Standard #
24.03	Integration of Knowledge and Ideas		
	24.03.1	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g. quantitative data, video, multimedia) in order to address a question or solve a problem. LAFS.1112.RST.3.7	
	24.03.2	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. LAFS.1112.RST.3.8	
	24.03.3	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. LAFS.1112.RST.3.9	
24.04	Range of Reading and Level of Text Complexity		
	24.04.1	By the end of grade 11, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	24.04.2	By the end of grade 12, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 11–CCR text complexity band independently and proficiently. LAFS.1112.RST.4.10	
25.0	Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Applied Robotics.		
25.01	Text Types and Purposes		
	25.01.1	Write arguments focused on discipline-specific content. LAFS.1112.WHST.1.1	
	25.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.1112.WHST.1.2	
25.02	Production and Distribution of Writing		
	25.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.1112.WHST.2.4	

Florida Standards			Correlation to CTE Program Standard #
	25.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.1112.WHST.2.5	
	25.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. LAFS.1112.WHST.2.6	
	25.03	Research to Build and Present Knowledge	
	25.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.1112.WHST.3.7	
	25.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. LAFS.1112.WHST.3.8	
	25.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.1112.WHST.3.9	
	25.04	Range of Writing	
	25.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.1112.WHST.4.10	
26.0	Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Applied Robotics.		
	26.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	
	26.02	Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
	26.03	Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	

Florida Standards	Correlation to CTE Program Standard #
26.04 Model with mathematics. MAFS.K12.MP.4.1	
26.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
26.06 Attend to precision. MAFS.K12.MP.6.1	
26.07 Look for and make use of structure. MAFS.K12.MP.7.1	
26.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
27.0 Describe the approaches, challenges, and problem-solving methodologies involved with integrating artificial intelligence into robotic systems. – The student will be able to:		SC.912.N.1.1; 3.5
27.01 Compare and contrast symbolic and sub-symbolic approaches to integrating artificial intelligence into robotic systems.		
27.02 Describe an intelligent agent and relate its role to the operation of robotic systems.	LAFS.1112.SL.1.1	
27.03 Discuss the classes of intelligent agents and their application in the design of robotic systems.	LAFS.1112.SL.1.1	
27.04 Describe the obstacles to integration of artificial intelligence components in robotic systems.	LAFS.1112.SL.1.1	
27.05 Discuss the methodologies and tools used in resolving systems integration challenges in robotic systems.	LAFS.1112.SL.1.1	
28.0 Describe the role of specialized sensors in the design and operation of robotic systems. – The student will be able to:		SC.912.E.5.10 SC.912.P.10.18, 19, 21; 12.2, 3
28.01 Explain how Global Positioning System (GPS) sensors are used in robotic systems.	LAFS.1112.SL.1.1	
28.02 Discuss the application of laser range finders to the operation of robotic systems.	LAFS.1112.SL.1.1	
28.03 Describe the types and uses of optical sensors in robotic systems.	LAFS.1112.SL.2.4, 5	
28.04 Describe the ways in which gyroscopes are used in robotic systems.	LAFS.1112.SL.2.4, 5	

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	28.05 Describe the operation of an accelerometer and the ways in which accelerometers are used in robotic systems.	LAFS.1112.SL.2.4, 5	
	28.06 Discuss the various types of pressure sensors and how they are used in robotic systems.	LAFS.1112.SL.1.1	
	28.07 Discuss the various applications of vision and voice activation sensors.	LAFS.1112.SL.1.1	
29.0	Describe the use of specialized electronic applications used in robotic systems. – The student will be able to:		SC.912.E.5.4 SC.912.P.10.15
	29.01 Explain the various methods for controlling robotic systems and the form of electronic feedback system needed for the appropriate sensor.	LAFS.1112.SL.1.1	
	29.02 Describe the concept of Fail Safe and how such components are integrated into robotic systems.	LAFS.1112.SL.1.1	
	29.03 Explain the fundamentals of LC, RC, and LCR circuitry and describe their use in robotic control and feedback systems.	LAFS.1112.SL.1.1	
	29.04 Describe the electronic operation and application of electrically, pneumatically, and hydraulically controlled robot systems.		
	29.05 Compare and contrast various sources for powering robotic systems, including solar cells, batteries, and radioisotope thermoelectric generators (RTGs).	LAFS.1112.SL.1.1	
30.0	Demonstrate an understanding of engineering technologies impacted by the evolution of robotics. – The student will be able to:		SC.912.N.1.1
	30.01 Discuss the robotics aspects of Human Computer Interface (HCI) relative to control, feedback, mobility, and communications.	LAFS.1112.SL.1.1	
	30.02 Compare and contrast the operation of reactive, behavior-based, and deliberative robot controllers.		
	30.03 Describe the applicability of hybrid systems, in which digital and analog devices and sensors interact over time.	LAFS.1112.SL.2.4, 5	
	30.04 Explain the role of Hybrid Control Systems (HCS) in the design and operation of robust robotic systems.	LAFS.1112.SL.1.1	
31.0	Demonstrate an understanding of underlying principles of environmental physics related to robotic technology. – The student will be able to:		SC.912.P.10.4
	31.01 Describe thermal dynamics and discuss its practical application to robotics, particularly as it relates to motor and gear selection.	LAFS.1112.SL.1.1	
	31.02 Describe the concept of pressure and relate its implications on robotic assemblies, include methods and forms or measurement.		
	31.03 Distinguish between tolerance and allowance.		
	31.04 Explain dimensional and variation tolerance and their applicability to the design and operation of robotic systems.	LAFS.1112.SL.1.1	
	31.05 Describe the concept of fault-tolerance as it is related to a robotic assembly's degrees of freedom.	LAFS.1112.SL.1.1	

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
32.0	Demonstrate an understanding of the impact of robotics on the manufacturing process. – The student will be able to:		SC.912.N.1.1; 3.5
32.01	Describe the essential steps in the conventional manufacturing process, identifying those susceptible to being performed by industrial robots.	LAFS.1112.SL.1.1	
32.02	Describe Computer Integrated Manufacturing (CIM) and its implications on and uses of robotic technologies.		
32.03	Explain the impact of 3D printing on rapid prototyping.	LAFS.1112.SL.1.1	
32.04	Describe the process and methodology for creating a rapid prototype of an interactive robot.		
32.05	Describe the implications of robots on micro-manufacturing processes.	LAFS.1112.SL.1.1	
33.0	Demonstrate an understanding of topographical and environmental considerations in robotic assembly design. – The student will be able to:		SC.912.N.1.1
33.01	Describe various robot design considerations related to the intended operating environment or medium.		
33.02	Explain the correlation between sensor selection and a robot's operating environment, capability, and autonomy.	LAFS.1112.SL.2.4, 5	
33.03	Explain the term obstacle avoidance and relate its importance to the design, mobility, and autonomy of a robot.	LAFS.1112.SL.2.4, 5	
34.0	Create a program to control a robotic system. – The student will be able to:		SC.912.N.1.1
34.01	Compare and contrast the popular programming languages used to program robots and discuss their suitability for particular environments.		
34.02	Distinguish between USB, fire wire, and serial connections and the availability of those connections on robotic assemblies.		
34.03	Distinguish between holonomic and non-holonomic motion planning relative to feedback and control applications.		
34.04	Describe the process of motion planning and the variations in the underlying algorithm or approach.	LAFS.1112.SL.2.4, 5	
35.0	Demonstrate an understanding of technologies for communication with and among robotic systems. – The student will be able to:		SC.912.N.1.1
35.01	Compare and contrast the features, capabilities, obstacles, and suitability of wired and wireless communication technologies for communicating with a variety of robots.	MAFS.912.A-REI.1.1	
35.02	Discuss the methodologies by which static and mobile networked robots communicate with each other.	LAFS.1112.SL.1.1	
35.03	Describe Bluetooth technology and discuss its applicability to robotics.	LAFS.1112.SL.1.1	

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	35.04 Describe the various forms of sensor-based feedback typically obtainable from a robotic assembly and explain their application and associated challenges (e.g., EMI, bandwidth, etc.) in specific robotic applications (e.g., surgery, hazardous environment inspection, low oxygen/underwater).	LAFS.1112.SL.1.1	
	35.05 Troubleshoot an inoperable wireless robotic communication connection.		
36.0	Solve problems using critical thinking skills, creativity and innovation. – The student will be able to:		SC.912.N.1.1
	36.01 Employ critical thinking skills independently and in teams to solve problems and make decisions.		
	36.02 Employ critical thinking and interpersonal skills to resolve conflicts.		
	36.03 Identify and document workplace performance goals and monitor progress toward those goals.		
	36.04 Conduct technical research to gather information necessary for decision-making.	LAFS.1112.W.3.7, 8	
37.0	Demonstrate an understanding of static and dynamic modeling and simulation concepts related to the design of robotic systems. – The student will be able to:		SC.912.N.3.5
	37.01 Differentiate between static and dynamic modeling relative to designing robotic systems.		
	37.02 Explain the role of simulation to the design of mobile and humanoid robots.	LAFS.1112.SL.1.1	
	37.03 Compare and contrast 3D modeling software applications for creating static and dynamic simulations.	LAFS.1112.SL.2.4, 5	
	37.04 Create a static simulation of a stationary robot featuring a single multi-segment manipulator.	LAFS.1112.SL.2.4, 5	
	37.05 Create a simulation of a mobile robot that features obstacle avoidance.	LAFS.1112.SL.2.4, 5	
38.0	Design, build, program, and configure a robot to perform predefined tasks. – The student will be able to:		SC.912.N.3.5
	38.01 Build a mobile robot.		
	38.02 Create programs as required using robotic software that will allow the robot to perform a set of tasks involving obstacle avoidance.		
	38.03 Configure servo motors to operate the robot.		
	38.04 Formulate examples of how the robot might be used or adapted for use in a manufacturing or other environment.		
	38.05 Create a portfolio, including drawings and specifications, describing the robot, the tasks and rationale, and the results.	LAFS.910.W.1.2; 2.4, 5, 6; 4.10	

Florida Department of Education
Student Performance Standards

Course Title: **Robotic Applications Capstone**
Course Number: **9410140**
Course Credit: **1**

Course Description:
This course provides students with extended content and skills essential to the design and operation of autonomous robotic systems in the context of a capstone project.

Florida Standards			Correlation to CTE Program Standard #
24.0	Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Applied Robotics.		
	24.01 Key Ideas and Details		
	24.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. LAFS.1112.RST.1.1	
	24.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.1112.RST.1.2	
	24.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.1112.RST.1.3	
	24.02 Craft and Structure		
	24.02.1	Determine the meaning of symbols key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. LAFS.1112.RST.2.4	
	24.02.2	Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. LAFS.1112.RST.2.5	
	24.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. LAFS.1112.RST.2.6	

Florida Standards			Correlation to CTE Program Standard #
24.03	Integration of Knowledge and Ideas		
	24.03.1	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g. quantitative data, video, multimedia) in order to address a question or solve a problem. LAFS.1112.RST.3.7	
	24.03.2	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. LAFS.1112.RST.3.8	
	24.03.3	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. LAFS.1112.RST.3.9	
24.04	Range of Reading and Level of Text Complexity		
	24.04.1	By the end of grade 11, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	24.04.2	By the end of grade 12, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 11–CCR text complexity band independently and proficiently. LAFS.1112.RST.4.10	
25.0	Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Applied Robotics.		
25.01	Text Types and Purposes		
	25.01.1	Write arguments focused on discipline-specific content. LAFS.1112.WHST.1.1	
	25.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.1112.WHST.1.2	
25.02	Production and Distribution of Writing		
	25.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.1112.WHST.2.4	

Florida Standards			Correlation to CTE Program Standard #
	25.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.1112.WHST.2.5	
	25.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. LAFS.1112.WHST.2.6	
	25.03	Research to Build and Present Knowledge	
	25.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.1112.WHST.3.7	
	25.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. LAFS.1112.WHST.3.8	
	25.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.1112.WHST.3.9	
	25.04	Range of Writing	
	25.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.1112.WHST.4.10	
26.0	Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Applied Robotics.		
	26.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	
	26.02	Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
	26.03	Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	

Florida Standards	Correlation to CTE Program Standard #
26.04 Model with mathematics. MAFS.K12.MP.4.1	
26.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
26.06 Attend to precision. MAFS.K12.MP.6.1	
26.07 Look for and make use of structure. MAFS.K12.MP.7.1	
26.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
39.0 Demonstrate an understanding of robotic applications (both stationary and mobile), their environments, and their unique design constraints. – The student will be able to:		
39.01 Describe robotic assemblies used in industrial manufacturing, the technologies they employ, their design criteria, and constraints.	LAFS.1112.SL.1.1	
39.02 Describe robotic assemblies used in outer space, the technologies they employ, their design criteria, and constraints.	LAFS.1112.SL.1.1	
39.03 Describe robotic assemblies used in hazardous or dangerous environments (e.g., underground, damaged buildings, et al), the technologies they employ, their design criteria, and constraints.	LAFS.1112.SL.1.1	
39.04 Describe robotic assemblies used in the medical field, the technologies they employ, their design criteria, and constraints.	LAFS.1112.SL.1.1	
39.05 Describe robotic assemblies used in underwater environments, the technologies they employ, their design criteria, and constraints.	LAFS.1112.SL.1.1	
39.06 Describe robotic assemblies used in high speed/repetitive manufacturing or processing environments, the technologies they employ, their design criteria, and constraints.	LAFS.1112.SL.1.1	
40.0 Design, build, program, and configure an autonomous robot to perform predefined tasks suitable for a particular robotic application. – The student will be able to:		
40.01 Design and build a stationary or mobile autonomous robot as appropriate to a given robotic purpose.		
40.02 Create programs as required using robotic software that will allow the robot to perform a set of tasks involving obstacle avoidance using a combination of tactile and non-tactile sensors.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
40.03	Incorporate principles of artificial intelligence into the design of an autonomous robot.		
40.04	Incorporate principles of thermodynamics, hydraulics, and pneumatics, as appropriate, into the design of an autonomous robot.		
40.05	Incorporate at least one advanced communication or sensor device (e.g., voice activation/feedback, computer vision, et al) into the design of an autonomous robot.		
40.06	Configure a robot for wireless control and feedback communications.		
40.07	Create a project portfolio describing the project and robot, including drawings and specifications, the tasks and rationale, process journal, budget report, and the results.	LAFS.1112.W.1.2; 2.4, 5, 6; 4.10	
40.08	Demonstrate the operation and capabilities of the robot to a review committee.	LAFS.1112.SL.2.4, 5	
41.0	Successfully work as a member of a team. – The student will be able to:		
41.01	Accept responsibility for specific tasks in a given situation.	LAFS.1112.SL.1.1	
41.02	Maintain a positive relationship with other team members.	LAFS.1112.SL.1.1	
41.03	Document progress, and provide feedback on work accomplished in a timely manner.	LAFS.1112.SL.1.1	
41.04	Complete assigned tasks in a timely and professional manner.	LAFS.1112.SL.1.1	
41.05	Reassign responsibilities when the need arises.	LAFS.1112.SL.1.1	
41.06	Complete daily tasks as assigned on one's own initiative.	LAFS.1112.SL.1.1	
42.0	Plan, organize, and carry out a project plan. – The student will be able to:		
42.01	Determine the scope of a project.		
42.02	Organize the team according to individual strengths.	LAFS.1112.SL.1.1	
42.03	Assign specific tasks within a team.	LAFS.1112.SL.1.1	
42.04	Determine project priorities.	LAFS.1112.SL.1.1	
42.05	Identify required resources.	LAFS.1112.W.3.8	
42.06	Record project progress in a process journal.	LAFS.1112.W.1.2	
42.07	Record and account for budget expenses during the life of the project.	LAFS.1112.W.1.2	

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
42.08 Carry out the project plan to successful completion and delivery.		
43.0 Manage resources. – The student will be able to:		
43.01 Identify required resources and associated costs for each stage of the project plan.		
43.02 Create a project budget based on the identified resources.		
43.03 Determine the methods needed to acquire needed resources.		
43.04 Demonstrate good judgment in the use of resources.		
43.05 Recycle and reuse resources where appropriate.		
43.06 Demonstrate an understanding of proper legal and ethical waste disposal.	LAFS.1112.W.3.9	
44.0 Use tools, materials, and processes in an appropriate and safe manner. – The student will be able to:		
44.01 Identify the proper tool for a given job.		
44.02 Use tools and machines in a safe manner.		
44.03 Adhere to laboratory safety rules and procedures.		
44.04 Identify the application of processes appropriate to the task at hand.		
44.05 Identify materials appropriate to their application.		

Additional Information

Laboratory Activities

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

Career and Technical Student Organization (CTSO)

The Florida Technology Student Association (FL-TSA) is the intercurricular career and technical student organization for providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

Cooperative Training – OJT

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

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 Occupational Completion Point (OCP) or a Modified Occupational Completion Point (MOCP). If needed, a student may enroll in the same career and technical course more than once. Documentation should be included in the IEP that clearly indicates that it is anticipated that the student may need an additional year to complete an OCP/MOCP. The student should work on different competencies and new applications of competencies each year toward completion of the OCP/MOCP. After achieving the competencies identified for the year, the student earns credit for the course. It is important to ensure that credits earned by students are reported accurately. The district's information system must be designed to accept multiple credits for the same course number for eligible students with disabilities.

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