

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 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. 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	
01.04.2		
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	NGSS-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	NGSS-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	NGSS-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	NGSS-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	NGSS-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. 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	
01.04.2		
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.		
15.05	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
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.		
19.0	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
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	
21.06	Identify the early research centers for aeronautics in the United States.	LAFS.910.W. 4.10 LAFS.910.SL.2.6	

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
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.		
23.05 Demonstrate an understanding of rocketry design and systems.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
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.		
26.02	Demonstrate an ability to perform a milling, engraving or turning operation utilizing a computer assisted manufacturing program.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
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.		
29.05	Demonstrate an understanding and application of mathematical concepts as they relate to determining space flight mechanics.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
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. 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	
36.04.2		
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.		
38.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	

Florida Standards		Correlation to CTE Program Standard #
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	
05.04	Compare resources involving trade-offs between competing values, such as availability, cost, desirability, and waste.	LAFS.1112.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.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	
15.03	Troubleshoot, analyze, and maintain systems to ensure safe and proper function and	LAFS.1112.R.1.1	

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
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:	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	NGSS-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	NGSS-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	NGSS-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.		
34.02	Develop a written plan of work for the design team to carry out the project.	LAFS.1112.W.1.2	

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
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.W.4.10	
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.fl DOE.org/academics/career-adult-edu/career-tech-edu/program-resources.shtml>