

**Florida Department of Education
CURRICULUM FRAMEWORK**

Program Title: Engineering Technology
Occupational Area: Technology Education
Program Numbers: 8607000
CIP Number: 0821.011700
Grade Level: Secondary 9-12, & 30, 31
Facility Design Code: 243, Related 808, 810, 849, 851, 852
CTSO: Florida Technology Student Association (FL-TSA)
Certification: INDUS ARTS @4 @6
 I ART-TEC 1 @2
 ENG 7 G

- I. **MAJOR CONCEPTS/CONTENT:** The purpose of this program is to provide students with a foundation of knowledge and technically oriented experiences in the study of the applications of engineering and its effect upon our lives and the choosing of an occupation. The content and activities will also include the study of entrepreneurship, safety, and leadership skills. This program focuses on transferable skills and stresses understanding and demonstration of the technological tools, machines, instruments, materials, processes and systems in business and industry.

Listed below are the courses that make up this program.

8600570 - Engineering Technology I
 8600670 - Engineering Technology II
 8601770 - Engineering Technology III
 8600520 - Principles of Engineering
 8600530 - Digital Electronics
 8600550 - Introduction to Engineering Design
 8600560 - Computer Integrated Manufacturing
 8600590 - Civil Engineering and Architecture
 8600620 - Aerospace Engineering
 8600630 - Biotechnical Engineering
 8600650 - Engineering Design and Development

- II. **LABORATORY ACTIVITIES:** Instruction and learning activities are provided in a laboratory setting using hands-on experiences with technology equipment, tools and materials appropriate to the course content.
- III. **SPECIAL NOTE:** The Florida Technology Student Association (FL-TSA) is the appropriate Career Student Organization for providing leadership training experiences and reinforcing specific career skills. Career Student Organizations, shall be an integral part of the career instructional program, and the activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, FAC. FL-TSA information can be obtained from the web site at <http://www.floridatsa.com>.

Advanced Applications in Technology (AAiT) - course number 8601900 is appropriate to be used for content area continuation in this program after all credits of this program have been completed. The purpose of this course is to provide students with the 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 Technology Education but also across the curriculum. See the (AAiT) framework for more information.

Work-Based Experience (WBE) - course number 8601800 is the appropriate course to provide 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 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 a Technology Education program consisting of three credits must be completed before enrolling in WBE. See the (WBE) framework for more information.

The Intermediate and Advanced courses in this program may articulate into post-secondary Tech-Prep 2 + 2 programs when taken in sequence. Tech-Prep 2 + 2 programs require articulation agreements between secondary and post-secondary educational agencies.

Course substitutions as defined in the Comprehensive Course Table for this program area may be used to qualify a student for Florida's Gold Seal Vocational Scholarship, providing all other eligibility requirements are met. The comprehensive course table requirements are available online at <<http://nwrdc.fsu.edu/fnbpcm02>>. Gold Seal Vocational Scholarship requirements are available online at <<http://www.myfloridaeducation.com/brfuture/gsvrequire.htm>>.

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Adult students with disabilities must self-identify and request such services. 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.

The student should demonstrate an understanding of prior grade specific knowledge covered in the national *Standards for Technological Literacy** (STL) and the Florida *Sunshine State Standards*. Benchmarks followed by a reference code indicate alignment with one or both of these documents.

* *Standards for Technological Literacy: Content for the Study of Technology.* Copyright 2000 by the International Technology Education Association. Reston, VA.

- III. **INTENDED OUTCOMES:** After successfully completing this program, the student will be able to:

TECHNOLOGICAL LITERACY STANDARDS

- 01.0 Demonstrate an understanding of the characteristics and scope of technology.
- 02.0 Demonstrate an understanding of the core concepts of technology.
- 03.0 Demonstrate an understanding of the relationships among technologies and the connection between technology and other fields of study.
- 04.0 Demonstrate an understanding of the cultural, social, economic, and political effects of technology.
- 05.0 Demonstrate an understanding of the effects of technology on the environment.
- 06.0 Demonstrate an understanding of the role of society in the development and use of technology.
- 07.0 Demonstrate an understanding of the influence of technology on history.
- 08.0 Demonstrate an understanding of the attributes of design.
- 09.0 Demonstrate an understanding of the engineering design.
- 10.0 Demonstrate an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving.
- 11.0 Demonstrate the abilities to apply the design process.
- 12.0 Demonstrate the abilities to use and maintain technological products and systems.
- 13.0 Demonstrate the abilities to assess the impact of products and systems.
- 14.0 Demonstrate an understanding of and be able to select and use medical technologies.
- 15.0 Demonstrate an understanding of and be able to select and use agricultural and related biotechnologies.
- 16.0 Demonstrate an understanding of and be able to select and use energy and power technologies.
- 17.0 Demonstrate an understanding of and be able to select and use information and communication technologies.
- 18.0 Demonstrate an understanding of and be able to select and use transportation technologies.
- 19.0 Demonstrate an understanding of and be able to select and use manufacturing technologies.
- 20.0 Demonstrate an understanding of and be able to select and use construction technologies.

TECHNICAL CONTENT STANDARDS

- 21.0 Demonstrate safe and appropriate use of tools and machines in engineering technology.
- 22.0 Demonstrate the ability to properly identify, organize, plan, and allocate resources.
- 23.0 Demonstrate the functional characteristics of the engineering design team.
- 24.0 Demonstrate technical knowledge and skills in the processes and systems related to engineering.
- 25.0 Demonstrate technical knowledge and skills in the designing, engineering, and analysis of constructed works.
- 26.0 Perform advanced study and technical skills related to engineering technology.
- 27.0 Demonstrate an understanding of career opportunities and requirements in the field of engineering technology.

- 28.0 Develop a design portfolio.
- 29.0 Communicate design solutions to an engineering problem.
- 30.0 Apply mathematical concepts in the solution of engineering problems.
- 31.0 Apply scientific concepts in the solution of engineering problems.

**Florida Department of Education
STUDENT PERFORMANCE STANDARDS**

Course Number: 8600570
Course Title: Engineering Technology I
Course Credit: 1

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

01.0 DEMONSTRATE AN UNDERSTANDING OF THE CHARACTERISTICS AND SCOPE OF TECHNOLOGY--The student will be able to:

- 01.01 Discuss the nature and development of technological knowledge and processes. STL.1.J, LA.B.2.4, LA.C.3.4, SC.H.3.4
- 01.02 Explain the rapid increase in the rate of technological development and diffusion. STL.1.K, LA.B.2.4, LA.D.2.4, MA.B.1.4
- 01.03 Conduct specific goal-directed research related to inventions and innovations. STL.1.L, LA.A.1.4, LA.A.2.4, LA.B.2.4
- 01.04 Discuss current technological developments that are/were driven by profit motive and the market. STL.1.M, SS.D.1.4

02.0 DEMONSTRATE AN UNDERSTANDING OF THE CORE CONCEPTS OF TECHNOLOGY--The student will be able to:

- 02.01 Identify systems thinking logic and creativity with appropriate compromises in complex real-life problems. STL.2.W
- 02.02 Define technological systems, which are the building blocks of technology and are embedded within larger technological, social, and environmental systems. STL.2.X, LA.D.2.4
- 02.03 Identify resources involving trade-offs between competing values, such as availability, cost, desirability, and waste. STL.2.Z, SS.D.1.4
- 02.04 Identify the criteria and constraints of a product or system and determine how they affect the final design and development. STL.2.AA, MA.A.5.4, MA.B.1.4, MA.B.3.4, MA.B.4.4, MA.E.3.4, SC.H.1.4
- 02.05 List strategies for optimizing a technological process or methodology of designing or making a product, dependent on criteria and constraints. STL.2.BB
- 02.06 Identify new technologies that create new processes. STL.2.CC
- 02.07 Describe a quality control process to ensure that a product, service or system meets established criteria. STL.2.DD
- 02.08 Define a management system as the process of planning, organizing, and controlling work. STL.2.EE

03.0 DEMONSTRATE AN UNDERSTANDING OF THE RELATIONSHIPS AMONG TECHNOLOGIES AND THE CONNECTION BETWEEN TECHNOLOGY AND OTHER FIELDS OF STUDY--The student will be able to:

- 03.01 Identify technology transfer occurring when a new user applies an existing innovation developed for one purpose in a different function. STL.3.G, SC.H.3.4

- 03.02 Identify technological innovation resulting when ideas, knowledge, or skills are shared within a technology, among technologies, or across other fields. STL.3.H, SC.H.3.4
- 03.03 Identify technological progresses that promote the advancement of science and mathematics. STL.3.J, LA.A.1.4, LA.B.1.4, SC.H.3.4
- 04.0 DEMONSTRATE AN UNDERSTANDING OF THE CULTURAL, SOCIAL, ECONOMIC, AND POLITICAL EFFECTS OF TECHNOLOGY--The student will be able to:
- 04.01 Identify changes caused by the use of technology ranging from gradual to rapid and from subtle to obvious. STL.4.H
- 04.02 Classify the use of technology involving weighing the trade-offs between the positive and the negative effects. STL.4.I, LA.B.2.4
- 04.03 Identify ethical considerations important in the development, selection, and use of technologies. STL.4.J, SC.H.1.4, SS.C.2.4
- 04.04 List the cultural, social, economic, and political changes caused by the transfer of a technology from one society to another. STL.4.K, LA.B.2.4, LA.E.1.4, SC.H.3.4
- 05.0 DEMONSTRATE AN UNDERSTANDING OF THE EFFECTS OF TECHNOLOGY ON THE ENVIRONMENT--The student will be able to:
- 05.01 Select technologies to conserve water, soil, and energy through such techniques as reusing, reducing and recycling. STL.5.G, SC.G.1.4, SC.G.2.4, SS.B.2.4
- 05.02 List trade-offs of developing technologies to reduce the use of resources. STL.5.H, SC.G.2.4, SS.D.1.4
- 05.03 Identify technologies devised to reduce the negative consequences of other technologies. STL.5.K
- 05.04 Discuss the implementation of technologies involving the weighing of trade-offs between predicted positive and negative effects on the environment. STL.5.L, SC.G.2.4, SC.H.3.4
- 06.0 DEMONSTRATE AN UNDERSTANDING OF THE ROLE OF SOCIETY IN THE DEVELOPMENT AND USE OF TECHNOLOGY--The student will be able to:
- 06.01 Collect societal opinions and demands, as well as corporate cultures to use as a basis for deciding whether or not to develop a technology. STL.6.I
- 06.02 Identify a number of different factors, such as advertising, the strength of the economy, the goals of a company, and the latest fads as contributors to shaping the design of and demand for various technologies. STL.6.J, LA.D.2.4, SS.A.1.4, SS.D.2.4
- 07.0 DEMONSTRATE AN UNDERSTANDING OF THE INFLUENCE OF TECHNOLOGY ON HISTORY--The student will be able to:
- 07.01 Define the history of technology as a powerful force in reshaping the social, cultural, political, and economic landscape. STL.7.I, LA.D.2.4, SS.A.2.4
- 07.02 Discuss that early in the history of technology, the development of many tools and machines was based not on scientific knowledge but on technological know-how. STL.7.J, SS.A.1.4
- 08.0 DEMONSTRATE AN UNDERSTANDING OF THE ATTRIBUTES OF DESIGN--The student will be able to:

- 08.01 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. STL.8.H
 - 08.02 Restate design problems that are seldom presented in a clearly defined form. STL.8.I, LA.D.1.4, LA.D.2.4
 - 08.03 Check and critique a design continually, and improve and revise the idea of the design as needed. STL.8.J, SC.H.1.4
 - 08.04 List competing requirements of a design, such as criteria, constraints, and efficiency. STL.8.K, MA.A.3.4, MA.B.1.4, MA.B.3.4, MA.B.4.4, MA.D.1.4, MA.D.2.4, MA.E.1.4
- 09.0 DEMONSTRATE AN UNDERSTANDING OF ENGINEERING DESIGN--The student will be able to:
- 09.01 Identify design principles used to evaluate existing designs, to collect data, and to guide the design process. STL.9.I
 - 09.02 Describe the influence of personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly on the Engineering Design process. STL.9.J, LA.D.1.4, SC.H.1.4
 - 09.03 Construct a prototype or a working model used to test a design concept by making actual observations and necessary adjustments. STL.9.K, MA.B.1.4, SC.H.1.4, SC.H.3.4
 - 09.04 Identify factors taken into account in the process of engineering. STL.9.L
- 10.0 DEMONSTRATE AN UNDERSTANDING OF THE ROLE OF TROUBLESHOOTING, RESEARCH AND DEVELOPMENT, INVENTION AND INNOVATION, AND EXPERIMENTATION IN PROBLEM SOLVING--The student will be able to:
- 10.01 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. STL.10.I
 - 10.02 Identify research needed to solve technological problems. STL.10.J, LA.A.1.4, LA.A.2.4
 - 10.03 Differentiate between technological and non-technological problems, and identify which problems can be solved using technology. STL.10.K, SC.H.1.4
 - 10.04 Utilize a multidisciplinary approach to solving technological problems. STL.10.L, MA.A.1.4, MA.A.3.4, MA.B.1.4, MA.B.3.4, MA.B.4.4, MA.E.1.4, MA.E.3.4, SC.H.1.4, SC.H.3.4
- 11.0 DEMONSTRATE THE ABILITIES TO APPLY THE DESIGN PROCESS--The student will be able to:
- 11.01 Identify the design problem to solve and decide whether or not to address it. STL.11.M, SC.H.1.4
 - 11.02 List criteria and constraints and determine how these will affect the design process. STL.11.N, MA.A.3.4, MA.B.1.4, MA.B.3.4, MA.B.4.4, MA.D.1.4, MA.D.2.4, MA.E.1.4, SC.H.1.4, SC.H.3.4
 - 11.03 Refine a design by using prototypes and modeling to ensure quality, efficiency, and productivity of the final product. STL.11.O

- 11.04 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. STL.11.P, MA.A.4.4, MA.B.1.4, MA.B.3.4, MA.B.4.4, SC.H.1.4, SC.H.3.4
 - 11.05 Develop a product or system using a design process. STL.11.Q
 - 11.06 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. STL.11.R, LA.B.2.4, LA.C.3.4, MA.B.4.4, MA.D.2.4, MA.E.1.4, MA.E.2.4, MA.E.3.4, SC.H.1.4, SC.H.3.4
- 12.0 DEMONSTRATE THE ABILITIES TO USE AND MAINTAIN TECHNOLOGICAL PRODUCTS AND SYSTEMS--The student will be able to:
- 12.01 Document processes and procedures and communicate them to different audiences using appropriate oral and written techniques. STL.12.L, LA.B.1.4, LA.B.2.4, LA.C.3.4
 - 12.02 Diagnose a system that is malfunctioning and use tools, materials, machines, and knowledge to repair it. STL.12.M
 - 12.03 Troubleshoot, analyze, and maintain systems to ensure safe and proper function and precision. STL.12.N
 - 12.04 Operate systems so that they function in the way they were designed. STL.12.O
 - 12.05 Use computers and calculators to access, retrieve, organize, process, maintain, interpret, and evaluate data and information in order to communicate. STL.12.P, LA.A.2.4, MA.E.1.4
- 13.0 DEMONSTRATE THE ABILITIES TO ASSESS THE IMPACT OF PRODUCTS AND SYSTEMS--The student will be able to:
- 13.01 Collect information and evaluate its quality. STL.13.J, LA.A.2.4, SC.H.1.4
 - 13.02 Synthesize data, analyze trends, and draw conclusions regarding the effect of technology on the individual, society, and the environment. STL.13.K, LA.A.2.4, SC.G.1.4, SC.G.2.4, SC.H.1.4
 - 13.03 Define assessment techniques, such as trend analysis and experimentation to make decisions about the future development of technology. STL.13.L, LA.A.2.4, MA.E.1.4, MA.E.2.4, MA.E.3.4
 - 13.04 Identify forecasting techniques to evaluate the results of altering natural systems. STL.13.M, MA.E.3.4, SC.G.2.4
- 16.0 DEMONSTRATE AN UNDERSTANDING OF AND BE ABLE TO SELECT AND USE ENERGY AND POWER TECHNOLOGIES--The student will be able to:
- 16.01 Discuss how energy cannot be created nor destroyed; however, it can be converted from one form to another. STL.16.J
 - 16.02 Categorize types of energy into major forms: thermal, radiant, electrical, mechanical, chemical, nuclear, and others. STL.16.K
 - 16.03 Classify energy resources as renewable or nonrenewable. STL.16.M
 - 16.04 Construct a power system having a source of energy, a process, and loads. STL.16.N
- 17.0 DEMONSTRATE AN UNDERSTANDING OF AND BE ABLE TO SELECT AND USE INFORMATION AND COMMUNICATION TECHNOLOGIES--The student will be able to:

- 17.01 Discuss information and communication technologies including the inputs, processes, and outputs associated with sending and receiving information. STL.17.L
 - 17.02 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. STL.17.M
 - 17.03 Use information and communication systems to inform, persuade, entertain, control, manage, and educate. STL.17.N
 - 17.04 Identify components of a communications system, including source, encoder, transmitter, receiver, decoder, storage, retrieval, and destination. STL.17.O
 - 17.05 Identify many ways to communicate information, such as graphic and electronic means. STL.17.P
 - 17.06 Communicate technological knowledge and processes using symbols, measurement, conventions, icons, graphic images, and languages that incorporate a variety of visual, auditory, and tactile stimuli. STL.17.Q
- 18.0 DEMONSTRATE AN UNDERSTANDING OF AND BE ABLE TO SELECT AND USE TRANSPORTATION TECHNOLOGIES--The student will be able to:
- 18.01 Analyze the vital role played by transportation in the operation of other technologies, such as manufacturing, construction, communication, health and safety, and agriculture. STL.18.J
 - 18.02 Define intermodalism as the use of different modes of transportation, such as highways, railways, and waterways as part of an interconnected system that can move people and goods easily from one mode to another. STL.18.K
 - 18.03 Discuss how transportation services and methods have led to a population that is regularly on the move. STL.18.L
 - 18.04 Identify processes and innovative techniques involved in the design of intelligent and non-intelligent transportation systems. STL.18.M
- 19.0 DEMONSTRATE AN UNDERSTANDING OF AND BE ABLE TO SELECT AND USE MANUFACTURING TECHNOLOGIES--The student will be able to:
- 19.01 Service products to keep them in good operating condition. STL.19.L
 - 19.02 Classify materials based on their qualities as natural, synthetic, or mixed. STL.19.M
 - 19.03 Classify goods as durable goods designed to operate for a long period of time, or non-durable goods designed to operate for a short period of time. STL.19.N
 - 19.04 Identify and classify manufacturing systems into types, such as customized production, batch production, and continuous production. STL.19.O
 - 19.05 Discuss the interchangeability of parts to increase the effectiveness of manufacturing processes. STL.19.P
 - 19.06 Employ marketing techniques involving establishing a product's identity, conducting research on its potential, advertising it, distributing it, and selling it. STL.19.R
- 20.0 DEMONSTRATE AN UNDERSTANDING OF AND BE ABLE TO SELECT AND USE CONSTRUCTION TECHNOLOGIES--The student will be able to:

- 20.01 Define infrastructure as the underlying base or basic framework of a system. STL.20.J
 - 20.02 Identify a variety of processes and procedures used in constructing structures. STL.20.K
 - 20.03 Identify requirements involved in the design of structures. STL.20.L
 - 20.04 Recommend maintenance, alterations, or renovations to improve a structure or alter its intended use. STL.20.M
 - 20.05 Identify prefabricated materials used in some structures. STL.20.N
- 21.0 DEMONSTRATE SAFE AND APPROPRIATE USE OF TOOLS AND MACHINES IN ENGINEERING TECHNOLOGY--The student will be able to:
- 21.01 Select appropriate tools, procedures, and/or equipment.
 - 21.02 Demonstrate the safe usage of appropriate tools, procedures, and operation of equipment.
 - 21.03 Follow laboratory safety rules and procedures.
 - 21.04 Demonstrate good housekeeping at workstation within total laboratory.
 - 21.05 Identify color-coding safety standards.
 - 21.06 Explain fire prevention and safety precautions and practices for extinguishing fires.
 - 21.07 Identify harmful effects/potential dangers of familiar hazardous substances/devices to people and the environment.
- 22.0 DEMONSTRATE THE ABILITY TO PROPERLY IDENTIFY, ORGANIZE, PLAN, AND ALLOCATE RESOURCES--The student will be able to:
- 22.01 Demonstrate the ability to select goal-relevant activities, rank them, allocate time, and prepare and follow schedules.
 - 22.02 Use or prepare budgets, make forecasts, keep records, and make adjustments to meet objectives. MA.B.3.4, MA.E.1.4
 - 22.03 Demonstrate the ability to acquire, store, allocate, and use materials or space efficiently.
 - 22.04 Display knowledge of the efficient use of human resources.
- 23.0 DEMONSTRATE THE FUNCTIONAL CHARACTERISTICS OF THE ENGINEERING DESIGN TEAM--The student will be able to:
- 23.01 Describe work breakdown organization.
 - 23.02 Describe work group organization schemes including functional and hierarchical schemes.
 - 23.03 Describe the function of management in general and project management in particular.
 - 23.04 Describe a typical design project team structure.
 - 23.05 Outline a research methodology. LA.B.1.4
 - 23.06 Demonstrate brainstorming techniques. LA.B.1.4
- 24.0 DEMONSTRATE TECHNICAL KNOWLEDGE AND SKILLS IN THE PROCESSES AND SYSTEMS RELATED TO ENGINEERING--The student will be able to:
- 24.01 Assemble, operate, and identify the parts of a fluid system. SC.C.1.4, SC.C.2.4, SC.H.3.4
 - 24.02 Demonstrate and apply principles of force, work, rate, resistance, energy, power, and force transformers relating to fluid systems. SC.C.1.4, SC.C.2.4

- 24.03 Assemble, operate, and identify the parts of a thermal system. SC.B.1.4, SC.B.2.4, SC.H.3.4
 - 24.04 Demonstrate and apply principles of force, work, rate, resistance, energy, power, and force transformers relating to thermal systems. SC.C.1.4, SC.C.2.4
 - 24.05 Assemble, operate, and identify the parts of an electrical system. SC.A.2.4, SC.C.2.4, SC.H.3.4
 - 24.06 Demonstrate and apply principles of force, work, rate, resistance, energy, power, and force transformers relating to electrical systems. SC.A.2.4, SC.C.1.4, SC.C.2.4
 - 24.07 Assemble, operate, and identify the parts of a mechanical system. SC.C.1.4, SC.C.2.4, SC.H.3.4
 - 24.08 Demonstrate and apply principles of force, work, rate, resistance, energy, power, and force transformers relating to mechanical systems. SC.C.1.4, SC.C.2.4
- 25.0 DEMONSTRATE TECHNICAL KNOWLEDGE AND SKILLS IN THE DESIGNING, ENGINEERING, AND ANALYSIS OF CONSTRUCTED WORKS--The student will be able to:
- 25.01 Define terminology associated with engineering products and systems.
 - 25.02 Define and describe the experimental method as it is applied to design.
 - 25.03 Describe simulation.
 - 25.04 Prepare a model of a design solution to an engineering problem. SC.H.3.4
 - 25.05 Prepare a graphical solution to an engineering problem. MA.D.2.4
 - 25.06 Prepare a mathematical solution to an engineering problem (using either a calculator or computer). MA.D.2.4
 - 25.07 Present a technical report on an engineering design problem, concept or issue. LA.B.1.4, LA.B.2.4, LA.C.3.4, LA.D.1.4

Florida Department of Education
STUDENT PERFORMANCE STANDARDS

Course Number: 8600670
Course Title: Engineering Technology II
Course Credit: 1

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

01.0 DEMONSTRATE AN UNDERSTANDING OF THE CHARACTERISTICS AND SCOPE OF TECHNOLOGY--The student will be able to:

- 01.01 Illustrate the nature and development of technological knowledge and processes. STL.1.J, LA.B.2.4, LA.C.3.4, SC.H.3.4
- 01.02 Graph the rapid increase in the rate of technological development and diffusion. STL.1.K, LA.B.2.4, LA.D.2.4, MA.B.1.4
- 01.03 Conduct specific goal-directed research related to inventions and innovations. STL.1.L, LA.A.1.4, LA.A.2.4, LA.B.2.4
- 01.04 Evaluate current technological developments that are/were driven by profit motive and the market. STL.1.M, SS.D.1.4

02.0 DEMONSTRATE AN UNDERSTANDING OF THE CORE CONCEPTS OF TECHNOLOGY--The student will be able to:

- 02.01 Apply systems thinking logic and creativity with appropriate compromises in complex real-life problems. STL.2.W
- 02.02 Discuss technological systems, which are the building blocks of technology and are embedded within larger technological, social, and environmental systems. STL.2.X, LA.D.2.4
- 02.03 Assess the stability of a technological system and its influence by all of the components in the system, especially those in the feedback loop. STL.2.Y
- 02.04 Select resources involving trade-offs between competing values, such as availability, cost, desirability, and waste. STL.2.Z, SS.D.1.4
- 02.05 Identify the criteria and constraints of a product or system and determine how they affect the final design and development. STL.2.AA, MA.A.5.4, MA.B.1.4, MA.B.3.4, MA.B.4.4, MA.E.3.4, SC.H.1.4
- 02.06 Implement strategies for optimizing a technological process or methodology of designing or making a product, dependent on criteria and constraints. STL.2.BB
- 02.07 Discuss new technologies that create new processes. STL.2.CC
- 02.08 Implement a quality control process to ensure that a product, service or system meets established criteria. STL.2.DD
- 02.09 Organize a management system as the process of planning, organizing, and controlling work. STL.2.EE

03.0 DEMONSTRATE AN UNDERSTANDING OF THE RELATIONSHIPS AMONG TECHNOLOGIES AND THE CONNECTION BETWEEN TECHNOLOGY AND OTHER FIELDS OF STUDY--The student will be able to:

- 03.01 Discuss technology transfer occurring when a new user applies an existing innovation developed for one purpose in a different function. STL.3.G, SC.H.3.4
- 03.02 Explain technological innovation resulting when ideas, knowledge, or skills are shared within a technology, among technologies, or across other fields. STL.3.H, SC.H.3.4
- 03.03 Discuss technological progresses that promote the advancement of science and mathematics. STL.3.J, LA.A.1.4, LA.B.1.4, SC.H.3.4
- 04.0 DEMONSTRATE AN UNDERSTANDING OF THE CULTURAL, SOCIAL, ECONOMIC, AND POLITICAL EFFECTS OF TECHNOLOGY--The student will be able to:
 - 04.01 Discuss changes caused by the use of technology ranging from gradual to rapid and from subtle to obvious. STL.4.H
 - 04.02 Compare the use of technology involving weighing the trade-offs between the positive and the negative effects. STL.4.I, LA.B.2.4
 - 04.03 Discuss ethical considerations important in the development, selection, and use of technologies. STL.4.J, SC.H.1.4, SS.C.2.4
 - 04.04 Debate the cultural, social, economic, and political changes caused by the transfer of a technology from one society to another. STL.4.K, LA.B.2.4, LA.E.1.4, SC.H.3.4
- 05.0 DEMONSTRATE AN UNDERSTANDING OF THE EFFECTS OF TECHNOLOGY ON THE ENVIRONMENT--The student will be able to:
 - 05.01 Compare trade-offs of developing technologies to reduce the use of resources. STL.5.H, SC.G.2.4, SS.D.1.4
 - 05.02 Compare and contrast the alignment of technological processes with natural processes to maximize performance and reduce negative impacts on the environment. STL.5.J, SC.G.2.4, SS.B.2.4
 - 05.03 Assess technologies devised to reduce the negative consequences of other technologies. STL.5.K
 - 05.04 Make decisions about the implementation of technologies involving the weighing of trade-offs between predicted positive and negative effects on the environment. STL.5.L, SC.G.2.4, SC.H.3.4
- 06.0 DEMONSTRATE AN UNDERSTANDING OF THE ROLE OF SOCIETY IN THE DEVELOPMENT AND USE OF TECHNOLOGY--The student will be able to:
 - 06.01 Consider societal opinions and demands, as well as corporate cultures to use as a basis for deciding whether or not to develop a technology. STL.6.I
 - 06.02 Consider a number of different factors, such as advertising, the strength of the economy, the goals of a company, and the latest fads as contributors to shaping the design of and demand for various technologies. STL.6.J, LA.D.2.4, SS.A.1.4, SS.D.2.4
- 07.0 DEMONSTRATE AN UNDERSTANDING OF THE INFLUENCE OF TECHNOLOGY ON HISTORY--The student will be able to:
 - 07.01 Research how the evolution of civilization has been directly affected by, and has in turn affected, the development and use of tools and materials. STL.7.H, LA.A.1.4, LA.A.2.4, LA.B.2.4, SC.H.3.4, SS.A.2.4

- 07.02 Define the history of technology as a powerful force in reshaping the social, cultural, political, and economic landscape. STL.7.I, LA.D.2.4, SS.A.2.4
 - 07.03 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. STL.7.J, SS.A.1.4
 - 07.04 Define the Iron Age as the use of iron and steel as the primary materials for tools. STL.7.K
 - 07.05 Define the Middle Ages and its development of many technological devices that produced long-lasting effects on technology and society. STL.7.L, SS.A.2.4
 - 07.06 Define the Renaissance, a time of rebirth of the arts and humanities, as an important development in the history of technology. STL.7.M, SS.A.3.4
 - 07.07 Discuss the Industrial Revolution and the development of continuous manufacturing, sophisticated transportation and communication systems, advanced construction practices, and improved education and leisure time. STL.7.N, SS.A.5.4
 - 07.08 Define the Information Age and its placement of emphasis on the processing and exchange of information. STL.7.O, SS.A.5.4
- 08.0 DEMONSTRATE AN UNDERSTANDING OF THE ATTRIBUTES OF DESIGN--The student will be able to:
- 08.01 Describe the design process; including defining a problem, brainstorming, researching and generating ideas, identifying criteria and specifying constraints, exploring possibilities, selecting an approach, developing a design proposal, making a model or prototype, testing and evaluating the design using specifications, refining the design, creating or making it, and communicating processes and results. STL.8.H
 - 08.02 Translate design problems that are seldom presented in a clearly defined form. STL.8.I, LA.D.1.4, LA.D.2.4
 - 08.03 Evaluate a design continually, and improve and revise the idea of the design as needed. STL.8.J, SC.H.1.4
 - 08.04 Analyze competing requirements of a design, such as criteria, constraints, and efficiency. STL.8.K, MA.A.3.4, MA.B.1.4, MA.B.3.4, MA.B.4.4, MA.D.1.4, MA.D.2.4, MA.E.1.4
- 09.0 DEMONSTRATE AN UNDERSTANDING OF ENGINEERING DESIGN--The student will be able to:
- 09.01 Investigate design principles used to evaluate existing designs, to collect data, and to guide the design process. STL.9.I
 - 09.02 Examine the influence of personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly on the Engineering Design process. STL.9.J, LA.D.1.4, SC.H.1.4
 - 09.03 Construct a prototype or a working model used to test a design concept by making actual observations and necessary adjustments. STL.9.K, MA.B.1.4, SC.H.1.4, SC.H.3.4
 - 09.04 Evaluate factors taken into account in the process of engineering. STL.9.L
- 10.0 DEMONSTRATE AN UNDERSTANDING OF THE ROLE OF TROUBLESHOOTING, RESEARCH AND DEVELOPMENT, INVENTION AND INNOVATION, AND EXPERIMENTATION IN PROBLEM SOLVING--The student will be able to:

- 10.01 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. STL.10.I
 - 10.02 Conduct research needed to solve technological problems. STL.10.J, LA.A.1.4, LA.A.2.4
 - 10.03 Differentiate between technological and non-technological problems, and identify which problems can be solved using technology. STL.10.K, SC.H.1.4
 - 10.04 Utilize a multidisciplinary approach to solving technological problems. STL.10.L, MA.A.1.4, MA.A.3.4, MA.B.1.4, MA.B.3.4, MA.B.4.4, MA.E.1.4, MA.E.3.4, SC.H.1.4, SC.H.3.4
- 11.0 DEMONSTRATE THE ABILITIES TO APPLY THE DESIGN PROCESS--The student will be able to:
- 11.01 Interpret the design problem to solve and decide whether or not to address it. STL.11.M, SC.H.1.4
 - 11.02 Evaluate criteria and constraints and determine how these will affect the design process. STL.11.N, MA.A.3.4, MA.B.1.4, MA.B.3.4, MA.B.4.4, MA.D.1.4, MA.D.2.4, MA.E.1.4, SC.H.1.4, SC.H.3.4
 - 11.03 Refine a design by using prototypes and modeling to ensure quality, efficiency, and productivity of the final product. STL.11.O
 - 11.04 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. STL.11.P, MA.A.4.4, MA.B.1.4, MA.B.3.4, MA.B.4.4, SC.H.1.4, SC.H.3.4
 - 11.05 Produce a product or system using a design process. STL.11.Q
 - 11.06 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. STL.11.R, LA.B.2.4, LA.C.3.4, MA.B.4.4, MA.D.2.4, MA.E.1.4, MA.E.2.4, MA.E.3.4, SC.H.1.4, SC.H.3.4
- 12.0 DEMONSTRATE THE ABILITIES TO USE AND MAINTAIN TECHNOLOGICAL PRODUCTS AND SYSTEMS--The student will be able to:
- 12.01 Document processes and procedures and communicate them to different audiences using appropriate oral and written techniques. STL.12.L, LA.B.1.4, LA.B.2.4, LA.C.3.4
 - 12.02 Diagnose a system that is malfunctioning and use tools, materials, machines, and knowledge to repair it. STL.12.M
 - 12.03 Troubleshoot, analyze, and maintain systems to ensure safe and proper function and precision. STL.12.N
 - 12.04 Operate systems so that they function in the way they were designed. STL.12.O
 - 12.05 Use computers and calculators to access, retrieve, organize, process, maintain, interpret, and evaluate data and information in order to communicate. STL.12.P, LA.A.2.4, MA.E.1.4
- 13.0 DEMONSTRATE THE ABILITIES TO ASSESS THE IMPACT OF PRODUCTS AND SYSTEMS--The student will be able to:

- 13.01 Collect information and evaluate its quality. STL.13.J, LA.A.2.4, SC.H.1.4
 - 13.02 Synthesize data, analyze trends, and draw conclusions regarding the effect of technology on the individual, society, and the environment. STL.13.K, LA.A.2.4, SC.G.1.4, SC.G.2.4, SC.H.1.4
 - 13.03 Apply assessment techniques, such as trend analysis and experimentation to make decisions about the future development of technology. STL.13.L, LA.A.2.4, MA.E.1.4, MA.E.2.4, MA.E.3.4
 - 13.04 Design forecasting techniques to evaluate the results of altering natural systems. STL.13.M, MA.E.3.4, SC.G.2.4
- 16.0 DEMONSTRATE AN UNDERSTANDING OF AND BE ABLE TO SELECT AND USE ENERGY AND POWER TECHNOLOGIES--The student will be able to:
- 16.01 Discuss how energy cannot be created nor destroyed; however, it can be converted from one form to another. STL.16.J
 - 16.02 Categorize types of energy into major forms: thermal, radiant, electrical, mechanical, chemical, nuclear, and others. STL.16.K
 - 16.03 Classify energy resources as renewable or nonrenewable. STL.16.M
 - 16.04 Construct a power system having a source of energy, a process, and loads. STL.16.N
- 17.0 DEMONSTRATE AN UNDERSTANDING OF AND BE ABLE TO SELECT AND USE INFORMATION AND COMMUNICATION TECHNOLOGIES--The student will be able to:
- 17.01 Discuss information and communication technologies including the inputs, processes, and outputs associated with sending and receiving information. STL.17.L
 - 17.02 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. STL.17.M
 - 17.03 Use information and communication systems to inform, persuade, entertain, control, manage, and educate. STL.17.N
 - 17.04 Identify components of a communications system, including source, encoder, transmitter, receiver, decoder, storage, retrieval, and destination. STL.17.O
 - 17.05 Identify many ways to communicate information, such as graphic and electronic means. STL.17.P
 - 17.06 Communicate technological knowledge and processes using symbols, measurement, conventions, icons, graphic images, and languages that incorporate a variety of visual, auditory, and tactile stimuli. STL.17.Q
- 18.0 DEMONSTRATE AN UNDERSTANDING OF AND BE ABLE TO SELECT AND USE TRANSPORTATION TECHNOLOGIES--The student will be able to:
- 18.01 Analyze the vital role played by transportation in the operation of other technologies, such as manufacturing, construction, communication, health and safety, and agriculture. STL.18.J
 - 18.02 Define intermodalism as the use of different modes of transportation, such as highways, railways, and waterways as part of an interconnected system that can move people and goods easily from one mode to another. STL.18.K
 - 18.03 Discuss how transportation services and methods have led to a population that is regularly on the move. STL.18.L

- 18.04 Identify processes and innovative techniques involved in the design of intelligent and non-intelligent transportation systems. STL.18.M
- 19.0 DEMONSTRATE AN UNDERSTANDING OF AND BE ABLE TO SELECT AND USE MANUFACTURING TECHNOLOGIES--The student will be able to:
- 19.01 Service products to keep them in good operating condition. STL.19.L
- 19.02 Classify materials based on their qualities as natural, synthetic, or mixed. STL.19.M
- 19.03 Classify goods as durable goods designed to operate for a long period of time, or non-durable goods designed to operate for a short period of time. STL.19.N
- 19.04 Identify and classify manufacturing systems into types, such as customized production, batch production, and continuous production. STL.19.O
- 19.05 Discuss the interchangeability of parts to increase the effectiveness of manufacturing processes. STL.19.P
- 19.06 Employ marketing techniques involving establishing a product's identity, conducting research on its potential, advertising it, distributing it, and selling it. STL.19.R
- 20.0 DEMONSTRATE AN UNDERSTANDING OF AND BE ABLE TO SELECT AND USE CONSTRUCTION TECHNOLOGIES--The student will be able to:
- 20.01 Define infrastructure as the underlying base or basic framework of a system. STL.20.J
- 20.02 Identify a variety of processes and procedures used in constructing structures. STL.20.K
- 20.03 Identify requirements involved in the design of structures. STL.20.L
- 20.04 Recommend maintenance, alterations, or renovations to improve a structure or alter its intended use. STL.20.M
- 20.05 Identify prefabricated materials used in some structures. STL.20.N
- 21.0 DEMONSTRATE SAFE AND APPROPRIATE USE OF TOOLS AND MACHINES IN ENGINEERING TECHNOLOGY--The student will be able to:
- 21.01 Select appropriate tools, procedures, and/or equipment.
- 21.02 Demonstrate the safe usage of appropriate tools, procedures, and operation of equipment.
- 21.03 Follow laboratory safety rules and procedures.
- 21.04 Demonstrate good housekeeping at workstation within total laboratory.
- 21.05 Identify color-coding safety standards.
- 21.06 Explain fire prevention and safety precautions and practices for extinguishing fires.
- 21.07 Identify harmful effects/potential dangers of familiar hazardous substances/devices to people and the environment.
- 22.0 DEMONSTRATE THE ABILITY TO PROPERLY IDENTIFY, ORGANIZE, PLAN, AND ALLOCATE RESOURCES--The student will be able to:
- 22.01 Demonstrate the ability to select goal-relevant activities, rank them, allocate time, and prepare and follow schedules.

- 22.02 Use or prepare budgets, make forecasts, keep records, and make adjustments to meet objectives. MA.B.3.4, MA.E.1.4
 - 22.03 Demonstrate the ability to acquire, store, allocate, and use materials or space efficiently.
 - 22.04 Display knowledge of the efficient use of human resources.
- 23.0 DEMONSTRATE THE FUNCTIONAL CHARACTERISTICS OF THE ENGINEERING DESIGN TEAM--The student will be able to:
- 23.01 Describe work breakdown organization.
 - 23.02 Describe work group organization schemes including functional and hierarchical schemes.
 - 23.03 Describe the function of management in general and project management in particular.
 - 23.04 Describe a typical design project team structure.
 - 23.05 Outline a research methodology. LA.B.1.4
 - 23.06 Demonstrate brainstorming techniques. LA.B.1.4
- 24.0 DEMONSTRATE TECHNICAL KNOWLEDGE AND SKILLS IN THE PROCESSES AND SYSTEMS RELATED TO ENGINEERING--The student will be able to:
- 24.01 Assemble, operate, and identify the parts of a fluid system. SC.C.1.4, SC.C.2.4, SC.H.3.4
 - 24.02 Demonstrate and apply principles of force, work, rate, resistance, energy, power, and force transformers relating to fluid systems. SC.C.1.4, SC.C.2.4
 - 24.03 Assemble, operate, and identify the parts of a thermal system. SC.B.1.4, SC.B.2.4, SC.H.3.4
 - 24.04 Demonstrate and apply principles of force, work, rate, resistance, energy, power, and force transformers relating to thermal systems. SC.C.1.4, SC.C.2.4
 - 24.05 Assemble, operate, and identify the parts of an electrical system. SC.A.2.4, SC.C.2.4, SC.H.3.4
 - 24.06 Demonstrate and apply principles of force, work, rate, resistance, energy, power, and force transformers relating to electrical systems. SC.A.2.4, SC.C.1.4, SC.C.2.4
 - 24.07 Assemble, operate, and identify the parts of a mechanical system. SC.C.1.4, SC.C.2.4, SC.H.3.4
 - 24.08 Demonstrate and apply principles of force, work, rate, resistance, energy, power, and force transformers relating to mechanical systems. SC.C.1.4, SC.C.2.4
- 25.0 DEMONSTRATE TECHNICAL KNOWLEDGE AND SKILLS IN THE DESIGNING, ENGINEERING, AND ANALYSIS OF CONSTRUCTED WORKS--The student will be able to:
- 25.01 Define terminology associated with engineering products and systems.
 - 25.02 Define and describe the experimental method as it is applied to design.
 - 25.03 Describe simulation.
 - 25.04 Prepare a model of a design solution to an engineering problem. SC.H.3.4
 - 25.05 Prepare a graphical solution to an engineering problem. MA.D.2.4
 - 25.06 Prepare a mathematical solution to an engineering problem (using either a calculator or computer). MA.D.2.4

25.07 Present a technical report on an engineering design problem, concept or issue. LA.B.1.4, LA.B.2.4, LA.C.3.4, LA.D.1.4

26.0 PERFORM ADVANCED STUDY AND TECHNICAL SKILLS RELATED TO ENGINEERING TECHNOLOGY--The student will be able to:

- 26.01 Identify an engineering problem or product for improvement using the design methodology.
- 26.02 Develop a written plan of work for the engineering team to carry out the project. LA.B.1.4, LA.B.2.4
- 26.03 Show evidence of technical study in support of the project. LA.A.1.4, LA.A.2.4
- 26.04 Perform skills related to the engineering project.
- 26.05 Complete the project as planned.
- 26.06 Demonstrate the engineering design solution to a fluid system problem. LA.C.3.4
- 26.07 Demonstrate the engineering design solution to an electrical system problem. LA.C.3.4
- 26.08 Demonstrate the engineering design solution to a thermal system problem. LA.C.3.4
- 26.09 Demonstrate the engineering design solution to a mechanical system problem. LA.C.3.4
- 26.10 Formulate conclusions based on the analysis of engineered products. MA.B.4.4, MA.E.1.4, MA.E.3.4

**Florida Department of Education
STUDENT PERFORMANCE STANDARDS**

Course Number: 8601770
Course Title: Engineering Technology III
Course Credit: 1

COURSE DESCRIPTION: This program provides students with an advanced understanding of the knowledge, human relations, and technological skills found today in technical profession.

- 01.00 DEMONSTRATE AN UNDERSTANDING OF THE CHARACTERISTICS AND SCOPE OF TECHNOLOGY--The student will be able to:
- 01.01 Conduct specific goal-directed research related to inventions and innovations. STL.1.L, LA.A.1.4, LA.A.2.4, LA.B.2.4
 - 01.02 Evaluate current technological developments that are/were driven by profit motive and the market. STL.1.M, SS.D.1.4
- 02.00 DEMONSTRATE AN UNDERSTANDING OF THE CORE CONCEPTS OF TECHNOLOGY--The student will be able to:
- 02.01 Apply systems thinking logic and creativity with appropriate compromises in complex real-life problems. STL.2.W
 - 02.02 Assess technological systems, which are the building blocks of technology and are embedded within larger technological, social, and environmental systems. STL.2.X, LA.D.2.4
 - 02.03 Assess the stability of a technological system and its influence by all of the components in the system, especially those in the feedback loop. STL.2.Y
 - 02.04 Compare resources involving trade-offs between competing values, such as availability, cost, desirability, and waste. STL.2.Z, SS.D.1.4
 - 02.05 Identify the criteria and constraints of a product or system and determine how they affect the final design and development. STL.2.AA, MA.A.5.4, MA.B.1.4, MA.B.3.4, MA.B.4.4, MA.E.3.4, SC.H.1.4
 - 02.06 Propose strategies for optimizing a technological process or methodology of designing or making a product, dependent on criteria and constraints. STL.2.BB
 - 02.07 Discuss new technologies that create new processes. STL.2.CC
 - 02.08 Recommend a quality control process to ensure that a product, service or system meets established criteria. STL.2.DD
 - 02.09 Organize a management system as the process of planning, organizing, and controlling work. STL.2.EE
 - 02.10 Outline complex systems that have many layers of controls and feedback loops to provide information. STL.2.FF
- 03.00 DEMONSTRATE AN UNDERSTANDING OF THE RELATIONSHIPS AMONG TECHNOLOGIES AND THE CONNECTION BETWEEN TECHNOLOGY AND OTHER FIELDS OF STUDY--The student will be able to:
- 03.01 Examine technology transfer occurring when a new user applies an existing innovation developed for one purpose in a different function. STL.3.G, SC.H.3.4

- 03.02 Examine technological innovation resulting when ideas, knowledge, or skills are shared within a technology, among technologies, or across other fields. STL.3.H, SC.H.3.4
- 03.03 Investigate technological progresses that promote the advancement of science and mathematics. STL.3.J, LA.A.1.4, LA.B.1.4, SC.H.3.4
- 04.0 DEMONSTRATE AN UNDERSTANDING OF THE CULTURAL, SOCIAL, ECONOMIC, AND POLITICAL EFFECTS OF TECHNOLOGY--The student will be able to:
- 04.01 Discuss changes caused by the use of technology ranging from gradual to rapid and from subtle to obvious. STL.4.H
- 04.02 Evaluate the use of technology involving weighing the trade-offs between the positive and the negative effects. STL.4.I, LA.B.2.4
- 04.03 Discuss ethical considerations important in the development, selection, and use of technologies. STL.4.J, SC.H.1.4, SS.C.2.4
- 04.04 Debate the cultural, social, economic, and political changes caused by the transfer of a technology from one society to another. STL.4.K, LA.B.2.4, LA.E.1.4, SC.H.3.4
- 05.0 DEMONSTRATE AN UNDERSTANDING OF THE EFFECTS OF TECHNOLOGY ON THE ENVIRONMENT--The student will be able to:
- 05.01 Consider trade-offs of developing technologies to reduce the use of resources. STL.5.H, SC.G.2.4, SS.D.1.4
- 05.02 Compare and contrast the alignment of technological processes with natural processes to maximize performance and reduce negative impacts on the environment. STL.5.J, SC.G.2.4, SS.B.2.4
- 05.03 Assess technologies devised to reduce the negative consequences of other technologies. STL.5.K
- 05.04 Make decisions about the implementation of technologies involving the weighing of trade-offs between predicted positive and negative effects on the environment. STL.5.L, SC.G.2.4, SC.H.3.4
- 06.0 DEMONSTRATE AN UNDERSTANDING OF THE ROLE OF SOCIETY IN THE DEVELOPMENT AND USE OF TECHNOLOGY--The student will be able to:
- 06.01 Consider societal opinions and demands, as well as corporate cultures to use as a basis for deciding whether or not to develop a technology. STL.6.I
- 06.02 Evaluate a number of different factors, such as advertising, the strength of the economy, the goals of a company, and the latest fads as contributors to shaping the design of and demand for various technologies. STL.6.J, LA.D.2.4, SS.A.1.4, SS.D.2.4
- 07.0 DEMONSTRATE AN UNDERSTANDING OF THE INFLUENCE OF TECHNOLOGY ON HISTORY--The student will be able to:
- 07.01 Assess how the evolution of civilization has been directly affected by, and has in turn affected, the development and use of tools and materials. STL.7.H, LA.A.1.4, LA.A.2.4, LA.B.2.4, SC.H.3.4, SS.A.2.4
- 07.02 Discuss the history of technology as a powerful force in reshaping the social, cultural, political, and economic landscape. STL.7.I, LA.D.2.4, SS.A.2.4

- 07.03 Describe the Iron Age as the use of iron and steel as the primary materials for tools. STL.7.K
 - 07.04 Discuss the Industrial Revolution and the development of continuous manufacturing, sophisticated transportation and communication systems, advanced construction practices, and improved education and leisure time. STL.7.N, SS.A.5.4
 - 07.05 Describe the Information Age and its placement of emphasis on the processing and exchange of information. STL.7.O, SS.A.5.4
- 08.0 DEMONSTRATE AN UNDERSTANDING OF THE ATTRIBUTES OF DESIGN--The student will be able to:
- 08.01 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. STL.8.H
 - 08.02 Translate design problems that are seldom presented in a clearly defined form. STL.8.I, LA.D.1.4, LA.D.2.4
 - 08.03 Evaluate a design continually, and improve and revise the idea of the design as needed. STL.8.J, SC.H.1.4
 - 08.04 Analyze competing requirements of a design, such as criteria, constraints, and efficiency. STL.8.K, MA.A.3.4, MA.B.1.4, MA.B.3.4, MA.B.4.4, MA.D.1.4, MA.D.2.4, MA.E.1.4
- 09.0 DEMONSTRATE AN UNDERSTANDING OF ENGINEERING DESIGN--The student will be able to:
- 09.01 Select design principles used to evaluate existing designs, to collect data, and to guide the design process. STL.9.I
 - 09.02 Examine the influence of personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly on the Engineering Design process. STL.9.J, LA.D.1.4, SC.H.1.4
 - 09.03 Construct a prototype or a working model used to test a design concept by making actual observations and necessary adjustments. STL.9.K, MA.B.1.4, SC.H.1.4, SC.H.3.4
 - 09.04 Evaluate factors taken into account in the process of engineering. STL.9.L
- 10.0 DEMONSTRATE AN UNDERSTANDING OF THE ROLE OF TROUBLESHOOTING, RESEARCH AND DEVELOPMENT, INVENTION AND INNOVATION, AND EXPERIMENTATION IN PROBLEM SOLVING--The student will be able to:
- 10.01 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. STL.10.I
 - 10.02 Conduct research needed to solve technological problems. STL.10.J, LA.A.1.4, LA.A.2.4
 - 10.03 Differentiate between technological and non-technological problems, and identify which problems can be solved using technology. STL.10.K, SC.H.1.4
 - 10.04 Utilize a multidisciplinary approach to solving technological problems. STL.10.L, MA.A.1.4, MA.A.3.4, MA.B.1.4, MA.B.3.4, MA.B.4.4, MA.E.1.4, MA.E.3.4, SC.H.1.4, SC.H.3.4

11.0 DEMONSTRATE THE ABILITIES TO APPLY THE DESIGN PROCESS--The student will be able to:

- 11.01 Interpret the design problem to solve and decide whether or not to address it. STL.11.M, SC.H.1.4
- 11.02 Evaluate criteria and constraints and determine how these will affect the design process. STL.11.N, MA.A.3.4, MA.B.1.4, MA.B.3.4, MA.B.4.4, MA.D.1.4, MA.D.2.4, MA.E.1.4, SC.H.1.4, SC.H.3.4
- 11.03 Refine a design by using prototypes and modeling to ensure quality, efficiency, and productivity of the final product. STL.11.O
- 11.04 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. STL.11.P, MA.A.4.4, MA.B.1.4, MA.B.3.4, MA.B.4.4, SC.H.1.4, SC.H.3.4
- 11.05 Produce a product or system using a design process. STL.11.Q
- 11.06 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. STL.11.R, LA.B.2.4, LA.C.3.4, MA.B.4.4, MA.D.2.4, MA.E.1.4, MA.E.2.4, MA.E.3.4, SC.H.1.4, SC.H.3.4

12.0 DEMONSTRATE THE ABILITIES TO USE AND MAINTAIN TECHNOLOGICAL PRODUCTS AND SYSTEMS--The student will be able to:

- 12.01 Document processes and procedures and communicate them to different audiences using appropriate oral and written techniques. STL.12.L, LA.B.1.4, LA.B.2.4, LA.C.3.4
- 12.02 Diagnose a system that is malfunctioning and use tools, materials, machines, and knowledge to repair it. STL.12.M
- 12.03 Troubleshoot, analyze, and maintain systems to ensure safe and proper function and precision. STL.12.N
- 12.04 Operate systems so that they function in the way they were designed. STL.12.O
- 12.05 Use computers and calculators to access, retrieve, organize, process, maintain, interpret, and evaluate data and information in order to communicate. STL.12.P, LA.A.2.4, MA.E.1.4

13.0 DEMONSTRATE THE ABILITIES TO ASSESS THE IMPACT OF PRODUCTS AND SYSTEMS--The student will be able to:

- 13.01 Collect information and evaluate its quality. STL.13.J, LA.A.2.4, SC.H.1.4
- 13.02 Synthesize data, analyze trends, and draw conclusions regarding the effect of technology on the individual, society, and the environment. STL.13.K, LA.A.2.4, SC.G.1.4, SC.G.2.4, SC.H.1.4
- 13.03 Apply assessment techniques, such as trend analysis and experimentation to make decisions about the future development of technology. STL.13.L, LA.A.2.4, MA.E.1.4, MA.E.2.4, MA.E.3.4
- 13.04 Design forecasting techniques to evaluate the results of altering natural systems. STL.13.M, MA.E.3.4, SC.G.2.4

16.0 DEMONSTRATE AN UNDERSTANDING OF AND BE ABLE TO SELECT AND USE ENERGY AND POWER TECHNOLOGIES--The student will be able to:

- 16.01 Discuss how energy cannot be created nor destroyed; however, it can be converted from one form to another. STL.16.J
 - 16.02 Categorize types of energy into major forms: thermal, radiant, electrical, mechanical, chemical, nuclear, and others. STL.16.K
 - 16.03 Classify energy resources as renewable or nonrenewable. STL.16.M
 - 16.04 Construct a power system having a source of energy, a process, and loads. STL.16.N
- 17.0 DEMONSTRATE AN UNDERSTANDING OF AND BE ABLE TO SELECT AND USE INFORMATION AND COMMUNICATION TECHNOLOGIES--The student will be able to:
- 17.01 Discuss information and communication technologies including the inputs, processes, and outputs associated with sending and receiving information. STL.17.L
 - 17.02 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. STL.17.M
 - 17.03 Use information and communication systems to inform, persuade, entertain, control, manage, and educate. STL.17.N
 - 17.04 Identify components of a communications system, including source, encoder, transmitter, receiver, decoder, storage, retrieval, and destination. STL.17.O
 - 17.05 Identify many ways to communicate information, such as graphic and electronic means. STL.17.P
 - 17.06 Communicate technological knowledge and processes using symbols, measurement, conventions, icons, graphic images, and languages that incorporate a variety of visual, auditory, and tactile stimuli. STL.17.Q
- 18.0 DEMONSTRATE AN UNDERSTANDING OF AND BE ABLE TO SELECT AND USE TRANSPORTATION TECHNOLOGIES--The student will be able to:
- 18.01 Analyze the vital role played by transportation in the operation of other technologies, such as manufacturing, construction, communication, health and safety, and agriculture. STL.18.J
 - 18.02 Define intermodalism as the use of different modes of transportation, such as highways, railways, and waterways as part of an interconnected system that can move people and goods easily from one mode to another. STL.18.K
 - 18.03 Discuss how transportation services and methods have led to a population that is regularly on the move. STL.18.L
 - 18.04 Identify processes and innovative techniques involved in the design of intelligent and non-intelligent transportation systems. STL.18.M
- 19.0 DEMONSTRATE AN UNDERSTANDING OF AND BE ABLE TO SELECT AND USE MANUFACTURING TECHNOLOGIES--The student will be able to:
- 19.01 Service products to keep them in good operating condition. STL.19.L
 - 19.02 Classify materials based on their qualities as natural, synthetic, or mixed. STL.19.M
 - 19.03 Classify goods as durable goods designed to operate for a long period of time, or non-durable goods designed to operate for a short period of time. STL.19.N

- 19.04 Identify and classify manufacturing systems into types, such as customized production, batch production, and continuous production. STL.19.0
 - 19.05 Discuss the interchangeability of parts to increase the effectiveness of manufacturing processes. STL.19.P
 - 19.06 Employ marketing techniques involving establishing a product's identity, conducting research on its potential, advertising it, distributing it, and selling it. STL.19.R
- 20.0 DEMONSTRATE AN UNDERSTANDING OF AND BE ABLE TO SELECT AND USE CONSTRUCTION TECHNOLOGIES--The student will be able to:
- 20.01 Define infrastructure as the underlying base or basic framework of a system. STL.20.J
 - 20.02 Identify a variety of processes and procedures used in constructing structures. STL.20.K
 - 20.03 Identify requirements involved in the design of structures. STL.20.L
 - 20.04 Recommend maintenance, alterations, or renovations to improve a structure or alter its intended use. STL.20.M
 - 20.05 Identify prefabricated materials used in some structures. STL.20.N
- 21.0 DEMONSTRATE SAFE AND APPROPRIATE USE OF TOOLS AND MACHINES IN ENGINEERING TECHNOLOGY--The student will be able to:
- 21.01 Select appropriate tools, procedures, and/or equipment.
 - 21.02 Demonstrate the safe usage of appropriate tools, procedures, and operation of equipment.
 - 21.03 Follow laboratory safety rules and procedures.
 - 21.04 Demonstrate good housekeeping at workstation within total laboratory.
 - 21.05 Identify color-coding safety standards.
 - 21.06 Explain fire prevention and safety precautions and practices for extinguishing fires.
 - 21.07 Identify harmful effects/potential dangers of familiar hazardous substances/devices to people and the environment.
- 22.0 DEMONSTRATE THE ABILITY TO PROPERLY IDENTIFY, ORGANIZE, PLAN, AND ALLOCATE RESOURCES--The student will be able to:
- 22.01 Demonstrate the ability to select goal-relevant activities, rank them, allocate time, and prepare and follow schedules.
 - 22.02 Use or prepare budgets, make forecasts, keep records, and make adjustments to meet objectives. MA.B.3.4, MA.E.1.4
 - 22.03 Demonstrate the ability to acquire, store, allocate, and use materials or space efficiently.
 - 22.04 Display knowledge of the efficient use of human resources.
- 23.0 DEMONSTRATE THE FUNCTIONAL CHARACTERISTICS OF THE ENGINEERING DESIGN TEAM--The student will be able to:
- 23.01 Describe work breakdown organization.
 - 23.02 Describe work group organization schemes including functional and hierarchical schemes.
 - 23.03 Describe the function of management in general and project management in particular.

- 23.04 Describe a typical design project team structure.
 - 23.05 Outline a research methodology. LA.B.1.4
 - 23.06 Demonstrate brainstorming techniques. LA.B.1.4
- 24.0 DEMONSTRATE TECHNICAL KNOWLEDGE AND SKILLS IN THE PROCESSES AND SYSTEMS RELATED TO ENGINEERING--The student will be able to:
- 24.01 Assemble, operate, and identify the parts of a fluid system.
SC.C.1.4, SC.C.2.4, SC.H.3.4
 - 24.02 Demonstrate and apply principles of force, work, rate, resistance, energy, power, and force transformers relating to fluid systems. SC.C.1.4, SC.C.2.4
 - 24.03 Assemble, operate, and identify the parts of a thermal system.
SC.B.1.4, SC.B.2.4, SC.H.3.4
 - 24.04 Demonstrate and apply principles of force, work, rate, resistance, energy, power, and force transformers relating to thermal systems. SC.C.1.4, SC.C.2.4
 - 24.05 Assemble, operate, and identify the parts of an electrical system. SC.A.2.4, SC.C.2.4, SC.H.3.4
 - 24.06 Demonstrate and apply principles of force, work, rate, resistance, energy, power, and force transformers relating to electrical systems. SC.A.2.4, SC.C.1.4, SC.C.2.4
 - 24.07 Assemble, operate, and identify the parts of a mechanical system.
SC.C.1.4, SC.C.2.4, SC.H.3.4
 - 24.08 Demonstrate and apply principles of force, work, rate, resistance, energy, power, and force transformers relating to mechanical systems. SC.C.1.4, SC.C.2.4
- 25.0 DEMONSTRATE TECHNICAL KNOWLEDGE AND SKILLS IN THE DESIGNING, ENGINEERING, AND ANALYSIS OF CONSTRUCTED WORKS--The student will be able to:
- 25.01 Define terminology associated with engineering products, processes, and systems.
 - 25.02 Define and describe the experimental method as it is applied to design.
 - 25.03 Describe simulation.
 - 25.04 Prepare a model of a design solution to an engineering problem.
SC.H.3.4
 - 25.05 Prepare a graphical solution to an engineering problem. MA.D.2.4
 - 25.06 Prepare a mathematical solution to an engineering problem (using either a calculator or computer). MA.D.2.4
 - 25.07 Present a technical report on an engineering design problem, concept or issue. LA.C.3.4, LA.D.1.4
- 26.0 PERFORM ADVANCED STUDY AND TECHNICAL SKILLS RELATED TO ENGINEERING TECHNOLOGY--The student will be able to:
- 26.01 Identify an engineering problem or product for improvement using engineering design methodology.
 - 26.02 Develop a written plan of work for the engineering team to carry out the project. LA.B.1.4, LA.B.2.4
 - 26.03 Show evidence of technical research in support of the project.
LA.A.1.4, LA.A.2.4
 - 26.04 Perform skills related to the engineering project.
 - 26.05 Complete the project as planned.

- 26.06 Demonstrate the engineering design solution to a fluid system problem. LA.C.3.4
 - 26.07 Demonstrate the engineering design solution to an electrical system problem. LA.C.3.4
 - 26.08 Demonstrate the engineering design solution to a thermal system problem. LA.C.3.4
 - 26.09 Demonstrate and present the engineering design solution to a mechanical system problem. LA.A.1.4, LA.A.2.4, LA.C.3.4
 - 26.10 Formulate conclusions based on the analysis of engineered products. MA.B.4.4, MA.E.1.4, MA.E.3.4
- 27.0 DEMONSTRATE AN UNDERSTANDING OF CAREER OPPORTUNITIES AND REQUIREMENTS IN THE FIELD OF ENGINEERING TECHNOLOGY--The student will be able to:
- 27.01 Discuss individual interests related to a career in engineering technology. LA.B.2.4
 - 27.02 Explore career opportunities related to engineering technology. LA.A.1.4, LA.A.2.4, LA.B.2.4
 - 27.03 Explore secondary education opportunities related to engineering technology. LA.A.1.4, LA.A.2.4, LA.B.2.4
 - 27.04 Conduct a job search. LA.A.1.4, LA.A.2.4
 - 27.05 Complete a job application form correctly. LA.B.2.4
 - 27.06 Demonstrate competence in job interview techniques. LA.C.1.4, LA.C.3.4, LA.D.1.4
 - 27.07 Create a professional resume and letter of introduction. LA.A.1.4, LA.A.2.4, LA.B.1.4, LA.B.2.4
 - 27.08 Solicit awards, letters of recommendation and recognition. LA.A.1.4, LA.A.2.4, LA.C.3.4, LA.D.1.4
 - 27.09 Organize work samples in a professional, presentable format. LA.B.2.4, LA.C.3.4, LA.D.1.4

**Florida Department of Education
STUDENT PERFORMANCE STANDARDS**

Course Number: 8600520
Course Title: Principles of Engineering
Course Credit: 1

COURSE DESCRIPTION: This course helps students understand the field of engineering/engineering technology. Exploring various technology systems and manufacturing processes help students learn how engineers and technicians use math, science and technology in an engineering problem solving process to benefit people. The course also includes concerns about social and political consequences of technological change.

01.0 DEMONSTRATE AN UNDERSTANDING OF THE CHARACTERISTICS AND SCOPE OF TECHNOLOGY--The student will be able to:

- 01.01 Conduct specific goal-directed research related to inventions and innovations. STL.1.L, LA.A.1.4, LA.A.2.4, LA.B.2.4
- 01.02 Evaluate current technological developments that are/were driven by profit motive and the market. STL.1.M, SS.D.1.4

02.0 DEMONSTRATE AN UNDERSTANDING OF THE CORE CONCEPTS OF TECHNOLOGY--The student will be able to:

- 02.01 Apply systems thinking logic and creativity with appropriate compromises in complex real-life problems. STL.2.W
- 02.02 Assess technological systems, which are the building blocks of technology and are embedded within larger technological, social, and environmental systems. STL.2.X, LA.D.2.4
- 02.03 Assess the stability of a technological system and its influence by all of the components in the system, especially those in the feedback loop. STL.2.Y
- 02.04 Compare resources involving trade-offs between competing values, such as availability, cost, desirability, and waste. STL.2.Z, SS.D.1.4
- 02.05 Identify the criteria and constraints of a product or system and determine how they affect the final design and development. STL.2.AA, MA.A.5.4, MA.B.1.4, MA.B.3.4, MA.B.4.4, MA.E.3.4, SC.H.1.4
- 02.06 Propose strategies for optimizing a technological process or methodology of designing or making a product, dependent on criteria and constraints. STL.2.BB
- 02.07 Discuss new technologies that create new processes. STL.2.CC
- 02.08 Recommend a quality control process to ensure that a product, service or system meets established criteria. STL.2.DD
- 02.09 Organize a management system as the process of planning, organizing, and controlling work. STL.2.EE
- 02.10 Outline complex systems that have many layers of controls and feedback loops to provide information. STL.2.FF

03.0 DEMONSTRATE AN UNDERSTANDING OF THE RELATIONSHIPS AMONG TECHNOLOGIES AND THE CONNECTION BETWEEN TECHNOLOGY AND OTHER FIELDS OF STUDY--The student will be able to:

- 03.01 Examine technology transfer occurring when a new user applies an existing innovation developed for one purpose in a different function. STL.3.G, SC.H.3.4
- 03.02 Examine technological innovation resulting when ideas, knowledge, or skills are shared within a technology, among technologies, or across other fields. STL.3.H, SC.H.3.4
- 03.03 Investigate technological progresses that promote the advancement of science and mathematics. STL.3.J, LA.A.1.4, LA.B.1.4, SC.H.3.4
- 04.0 DEMONSTRATE AN UNDERSTANDING OF THE CULTURAL, SOCIAL, ECONOMIC, AND POLITICAL EFFECTS OF TECHNOLOGY--The student will be able to:
 - 04.01 Discuss changes caused by the use of technology ranging from gradual to rapid and from subtle to obvious. STL.4.H
 - 04.02 Evaluate the use of technology involving weighing the trade-offs between the positive and the negative effects. STL.4.I, LA.B.2.4
 - 04.03 Discuss ethical considerations important in the development, selection, and use of technologies. STL.4.J, SC.H.1.4, SS.C.2.4
 - 04.04 Debate the cultural, social, economic, and political changes caused by the transfer of a technology from one society to another. STL.4.K, LA.B.2.4, LA.E.1.4, SC.H.3.4
 - 04.05 Understand how social, environmental and financial constraints influence the engineering process.
- 05.0 DEMONSTRATE AN UNDERSTANDING OF THE EFFECTS OF TECHNOLOGY ON THE ENVIRONMENT--The student will be able to:
 - 05.01 Consider trade-offs of developing technologies to reduce the use of resources. STL.5.H, SC.G.2.4, SS.D.1.4
 - 05.02 Compare and contrast the alignment of technological processes with natural processes to maximize performance and reduce negative impacts on the environment. STL.5.J, SC.G.2.4, SS.B.2.4
 - 05.03 Assess technologies devised to reduce the negative consequences of other technologies. STL.5.K
 - 05.04 Make decisions about the implementation of technologies involving the weighing of trade-offs between predicted positive and negative effects on the environment. STL.5.L, SC.G.2.4, SC.H.3.4
- 06.0 DEMONSTRATE AN UNDERSTANDING OF THE ROLE OF SOCIETY IN THE DEVELOPMENT AND USE OF TECHNOLOGY--The student will be able to:
 - 06.01 Consider societal opinions and demands, as well as corporate cultures to use as a basis for deciding whether or not to develop a technology. STL.6.I
 - 06.02 Evaluate a number of different factors, such as advertising, the strength of the economy, the goals of a company, and the latest fads as contributors to shaping the design of and demand for various technologies. STL.6.J, LA.D.2.4, SS.A.1.4, SS.D.2.4
 - 06.03 Understand how ethics influences the engineering process.
- 07.0 DEMONSTRATE AN UNDERSTANDING OF THE INFLUENCE OF TECHNOLOGY ON HISTORY--The student will be able to:
 - 07.01 Assess how the evolution of civilization has been directly affected by, and has in turn affected, the development and use of

- tools and materials. STL.7.H, LA.A.1.4, LA.A.2.4, LA.B.2.4, SC.H.3.4, SS.A.2.4
- 07.02 Discuss the history of technology as a powerful force in reshaping the social, cultural, political, and economic landscape. STL.7.I, LA.D.2.4, SS.A.2.4
- 07.03 Describe the Iron Age as the use of iron and steel as the primary materials for tools. STL.7.K
- 07.04 Discuss the Industrial Revolution and the development of continuous manufacturing, sophisticated transportation and communication systems, advanced construction practices, and improved education and leisure time. STL.7.N, SS.A.5.4
- 07.05 Describe the Information Age and its placement of emphasis on the processing and exchange of information. STL.7.O, SS.A.5.4
- 07.06 Students will have an understanding of engineering and be able to identify engineering achievements through history.
- 07.07 Students will be able to identify five historical engineering role models, including minorities and women.
- 07.08 Students will trace the history of an invention and evaluate its effects on society and the environment.
- 07.09 Students will examine the evolution of an invention to observe and report on how the design process is applied to continuously redesign and improve the product.
- 08.0 DEMONSTRATE AN UNDERSTANDING OF THE ATTRIBUTES OF DESIGN--The student will be able to:
- 08.01 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. STL.8.H
- 08.02 Translate design problems that are seldom presented in a clearly defined form. STL.8.I, LA.D.1.4, LA.D.2.4
- 08.03 Evaluate a design continually, and improve and revise the idea of the design as needed. STL.8.J, SC.H.1.4
- 08.04 Analyze competing requirements of a design, such as criteria, constraints, and efficiency. STL.8.K, MA.A.3.4, MA.B.1.4, MA.B.3.4, MA.B.4.4, MA.D.1.4, MA.D.2.4, MA.E.1.4
- 09.0 DEMONSTRATE AN UNDERSTANDING OF ENGINEERING DESIGN--The student will be able to:
- 09.01 Select design principles used to evaluate existing designs, to collect data, and to guide the design process. STL.9.I
- 09.02 Examine the influence of personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly on the Engineering Design process. STL.9.J, LA.D.1.4, SC.H.1.4
- 09.03 Construct a prototype or a working model used to test a design concept by making actual observations and necessary adjustments. STL.9.K, MA.B.1.4, SC.H.1.4, SC.H.3.4
- 09.04 Evaluate factors taken into account in the process of engineering. STL.9.L
- 09.05 Students will be able to identify problems for engineers to solve in the future.

- 10.0 DEMONSTRATE AN UNDERSTANDING OF THE ROLE OF TROUBLESHOOTING, RESEARCH AND DEVELOPMENT, INVENTION AND INNOVATION, AND EXPERIMENTATION IN PROBLEM SOLVING--The student will be able to:
- 10.01 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. STL.10.I
 - 10.02 Conduct research needed to solve technological problems. STL.10.J, LA.A.1.4, LA.A.2.4
 - 10.03 Differentiate between technological and non-technological problems, and identify which problems can be solved using technology. STL.10.K, SC.H.1.4
 - 10.04 Utilize a multidisciplinary approach to solving technological problems. STL.10.L, MA.A.1.4, MA.A.3.4, MA.B.1.4, MA.B.3.4, MA.B.4.4, MA.E.1.4, MA.E.3.4, SC.H.1.4, SC.H.3.4
- 11.0 DEMONSTRATE THE ABILITIES TO APPLY THE DESIGN PROCESS--The student will be able to:
- 11.01 Interpret the design problem to solve and decide whether or not to address it. STL.11.M, SC.H.1.4
 - 11.02 Evaluate criteria and constraints and determine how these will affect the design process. STL.11.N, MA.A.3.4, MA.B.1.4, MA.B.3.4, MA.B.4.4, MA.D.1.4, MA.D.2.4, MA.E.1.4, SC.H.1.4, SC.H.3.4
 - 11.03 Refine a design by using prototypes and modeling to ensure quality, efficiency, and productivity of the final product. STL.11.O
 - 11.04 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. STL.11.P, MA.A.4.4, MA.B.1.4, MA.B.3.4, MA.B.4.4, SC.H.1.4, SC.H.3.4
 - 11.05 Produce a product or system using a design process. STL.11.Q
 - 11.06 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. STL.11.R, LA.B.2.4, LA.C.3.4, MA.B.4.4, MA.D.2.4, MA.E.1.4, MA.E.2.4, MA.E.3.4, SC.H.1.4, SC.H.3.4
- 12.0 DEMONSTRATE THE ABILITIES TO USE AND MAINTAIN TECHNOLOGICAL PRODUCTS AND SYSTEMS--The student will be able to:
- 12.01 Document processes and procedures and communicate them to different audiences using appropriate oral and written techniques. STL.12.L, LA.B.1.4, LA.B.2.4, LA.C.3.4
 - 12.02 Diagnose a system that is malfunctioning and use tools, materials, machines, and knowledge to repair it. STL.12.M
 - 12.03 Troubleshoot, analyze, and maintain systems to ensure safe and proper function and precision. STL.12.N
 - 12.04 Operate systems so that they function in the way they were designed. STL.12.O
 - 12.05 Use computers and calculators to access, retrieve, organize, process, maintain, interpret, and evaluate data and information in order to communicate. STL.12.P, LA.A.2.4, MA.E.1.4

- 13.0 DEMONSTRATE THE ABILITIES TO ASSESS THE IMPACT OF PRODUCTS AND SYSTEMS--
 -The student will be able to:
- 13.01 Collect information and evaluate its quality. STL.13.J, LA.A.2.4, SC.H.1.4
 - 13.02 Synthesize data, analyze trends, and draw conclusions regarding the effect of technology on the individual, society, and the environment. STL.13.K, LA.A.2.4, SC.G.1.4, SC.G.2.4, SC.H.1.4
 - 13.03 Apply assessment techniques, such as trend analysis and experimentation to make decisions about the future development of technology. STL.13.L, LA.A.2.4, MA.E.1.4, MA.E.2.4, MA.E.3.4
 - 13.04 Design forecasting techniques to evaluate the results of altering natural systems. STL.13.M, MA.E.3.4, SC.G.2.4
 - 13.05 Students will appraise community needs and evaluate the impact supplying electrical generation has on their communities.
- 16.0 DEMONSTRATE AN UNDERSTANDING OF AND BE ABLE TO SELECT AND USE ENERGY AND POWER TECHNOLOGIES--The student will be able to:
- 16.01 Discuss how energy cannot be created nor destroyed; however, it can be converted from one form to another. STL.16.J
 - 16.02 Categorize types of energy into major forms: thermal, radiant, electrical, mechanical, chemical, nuclear, and others. STL.16.K
 - 16.03 Classify energy resources as renewable or nonrenewable. STL.16.M
 - 16.04 Construct a power system having a source of energy, a process, and loads. STL.16.N
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- 17.01 Discuss information and communication technologies including the inputs, processes, and outputs associated with sending and receiving information. STL.17.L
 - 17.02 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. STL.17.M
 - 17.03 Use information and communication systems to inform, persuade, entertain, control, manage, and educate. STL.17.N
 - 17.04 Identify components of a communications system, including source, encoder, transmitter, receiver, decoder, storage, retrieval, and destination. STL.17.0
 - 17.05 Identify many ways to communicate information, such as graphic and electronic means. STL.17.P
 - 17.06 Communicate technological knowledge and processes using symbols, measurement, conventions, icons, graphic images, and languages that incorporate a variety of visual, auditory, and tactile stimuli. STL.17.Q
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- 18.01 Analyze the vital role played by transportation in the operation of other technologies, such as manufacturing, construction, communication, health and safety, and agriculture. STL.18.J
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- of an interconnected system that can move people and goods easily from one mode to another. STL.18.K
- 18.03 Discuss how transportation services and methods have led to a population that is regularly on the move. STL.18.L
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- 19.02 Classify materials based on their qualities as natural, synthetic, or mixed. STL.19.M
- 19.03 Classify goods as durable goods designed to operate for a long period of time, or non-durable goods designed to operate for a short period of time. STL.19.N
- 19.04 Identify and classify manufacturing systems into types, such as customized production, batch production, and continuous production. STL.19.O
- 19.05 Discuss the interchangeability of parts to increase the effectiveness of manufacturing processes. STL.19.P
- 19.06 Employ marketing techniques involving establishing a product's identity, conducting research on its potential, advertising it, distributing it, and selling it. STL.19.R
- 19.07 Students will explain the effects that stress has on a material and explain how the material will react.
- 19.08 Students will be able to trace the production of raw material to finished product.
- 19.09 Students will be able to identify practical applications of each material category to engineered products and processes.
- 19.10 Students will be able to collect, analyze, and test samples of the four basic materials.
- 19.11 Students will be able to document and present laboratory data related to studies of material classifications.
- 19.12 Students will be able to identify and document the properties of materials.
- 19.13 Students will be able to design an experiment to identify an unknown material.
- 19.14 Students will be able to define and state examples of the major categories of Production Processes.
- 19.15 Students will be able to analyze a component of a product and describe the processes used in its creation.
- 19.16 Students will be able to interpret a drawing and produce a part.
- 20.0 DEMONSTRATE AN UNDERSTANDING OF AND BE ABLE TO SELECT AND USE CONSTRUCTION TECHNOLOGIES--The student will be able to:
- 20.01 Define infrastructure as the underlying base or basic framework of a system. STL.20.J
- 20.02 Identify a variety of processes and procedures used in constructing structures. STL.20.K
- 20.03 Identify requirements involved in the design of structures. STL.20.L
- 20.04 Recommend maintenance, alterations, or renovations to improve a structure or alter its intended use. STL.20.M

- 20.05 Identify prefabricated materials used in some structures.
STL.20.N
- 21.0 DEMONSTRATE SAFE AND APPROPRIATE USE OF TOOLS AND MACHINES IN ENGINEERING TECHNOLOGY--The student will be able to:
- 21.01 Select appropriate tools, procedures, and/or equipment.
 - 21.02 Demonstrate the safe usage of appropriate tools, procedures, and operation of equipment.
 - 21.03 Follow laboratory safety rules and procedures.
 - 21.04 Demonstrate good housekeeping at workstation within total laboratory.
 - 21.05 Identify color-coding safety standards.
 - 21.06 Explain fire prevention and safety precautions and practices for extinguishing fires.
 - 21.07 Identify harmful effects/potential dangers of familiar hazardous substances/devices to people and the environment.
 - 21.08 Students will safely demonstrate proper setup and adjustment of a fluid power system.
 - 21.09 Students explain the use of factors of safety in the design process.
- 22.0 DEMONSTRATE THE ABILITY TO PROPERLY IDENTIFY, ORGANIZE, PLAN, AND ALLOCATE RESOURCES--The student will be able to:
- 22.01 Demonstrate the ability to select goal-relevant activities, rank them, allocate time, and prepare and follow schedules.
 - 22.02 Use or prepare budgets, make forecasts, keep records, and make adjustments to meet objectives. MA.B.3.4, MA.E.1.4
 - 22.03 Demonstrate the ability to acquire, store, allocate, and use materials or space efficiently.
 - 22.04 Display knowledge of the efficient use of human resources.
- 23.0 DEMONSTRATE THE FUNCTIONAL CHARACTERISTICS OF THE ENGINEERING DESIGN TEAM--The student will be able to:
- 23.01 Describe work breakdown organization.
 - 23.02 Describe work group organization schemes including functional and hierarchical schemes.
 - 23.03 Describe the function of management in general and project management in particular.
 - 23.04 Describe a typical design project team structure.
 - 23.05 Outline a research methodology. LA.B.1.4
 - 23.06 Demonstrate brainstorming techniques. LA.B.1.4
 - 23.07 Students will be able to define attributes associated with being a successful engineer.
 - 23.08 Understand that an engineering team must work together to solve problems, with each team member having individual and collective responsibilities.
 - 23.09 Understand the role of out-sourcing in the engineering process, and how effective communication is essential.
 - 23.10 Understand how gender-bias, racial-bias and other forms of stereotyping and discrimination can adversely affect communications within an engineering team.
- 24.0 DEMONSTRATE TECHNICAL KNOWLEDGE AND SKILLS IN THE PROCESSES AND SYSTEMS RELATED TO ENGINEERING--The student will be able to:

- 24.01 Assemble, operate, and identify the parts of a fluid system.
SC.C.1.4, SC.C.2.4, SC.H.3.4
 - 24.02 Demonstrate and apply principles of force, work, rate,
resistance, energy, power, and force transformers relating to
fluid systems. SC.C.1.4, SC.C.2.4
 - 24.03 Assemble, operate, and identify the parts of a thermal system.
SC.B.1.4, SC.B.2.4, SC.H.3.4
 - 24.04 Demonstrate and apply principles of force, work, rate,
resistance, energy, power, and force transformers relating to
thermal systems. SC.C.1.4, SC.C.2.4
 - 24.05 Assemble, operate, and identify the parts of an electrical
system. SC.A.2.4, SC.C.2.4, SC.H.3.4
 - 24.06 Demonstrate and apply principles of force, work, rate,
resistance, energy, power, and force transformers relating to
electrical systems. SC.A.2.4, SC.C.1.4, SC.C.2.4
 - 24.07 Assemble, operate, and identify the parts of a mechanical system.
SC.C.1.4, SC.C.2.4, SC.H.3.4
 - 24.08 Students will identify and explain the function of the essential
components of a mechanical system on a display they create.
 - 24.09 Students will create a display of a mechanical system from a
household item they disassemble.
 - 24.10 Students will evaluate and select specific fluid power sources
for different functions.
 - 24.11 Students will design, diagram and implement a program to control
a device they construct to perform a sorting operation.
 - 24.12 Students will select and apply concepts of mechanical,
electrical, and control systems in solving design problems.
 - 24.13 Students will formulate a plan for evaluating the functioning of
their sorting device and to make appropriate changes in design,
circuitry or programming.
- 25.0 DEMONSTRATE TECHNICAL KNOWLEDGE AND SKILLS IN THE DESIGNING,
ENGINEERING, AND ANALYSIS OF CONSTRUCTED WORKS--The student will be
able to:
- 25.01 Define terminology associated with engineering products,
processes, and systems.
 - 25.02 Define and describe the experimental method as it is applied to
design.
 - 25.03 Describe simulation.
 - 25.04 Prepare a model of a design solution to an engineering problem.
SC.H.3.4
 - 25.05 Prepare a graphical solution to an engineering problem. MA.D.2.4
 - 25.06 Prepare a mathematical solution to an engineering problem (using
either a calculator or computer). MA.D.2.4
 - 25.07 Present a technical report on an engineering design problem,
concept or issue. LA.C.3.4, LA.D.1.4
- 26.0 PERFORM ADVANCED STUDY AND TECHNICAL SKILLS RELATED TO ENGINEERING
TECHNOLOGY--The student will be able to:
- 26.01 Identify an engineering problem or product for improvement using
engineering design methodology.
 - 26.02 Develop a written plan of work for the engineering team to carry
out the project. LA.B.1.4, LA.B.2.4

- 26.03 Show evidence of technical research in support of the project.
LA.A.1.4, LA.A.2.4
 - 26.04 Perform skills related to the engineering project.
 - 26.05 Complete the project as planned.
 - 26.06 Demonstrate the engineering design solution to a fluid system problem. LA.C.3.4
 - 26.07 Demonstrate the engineering design solution to an electrical system problem. LA.C.3.4
 - 26.08 Demonstrate the engineering design solution to a thermal system problem. LA.C.3.4
 - 26.09 Demonstrate and present the engineering design solution to a mechanical system problem. LA.A.1.4, LA.A.2.4, LA.C.3.4
 - 26.10 Formulate conclusions based on the analysis of engineered products. MA.B.4.4, MA.E.1.4, MA.E.3.4
- 27.0 DEMONSTRATE AN UNDERSTANDING OF CAREER OPPORTUNITIES AND REQUIREMENTS IN THE FIELD OF ENGINEERING TECHNOLOGY--The student will be able to:
- 27.01 Discuss individual interests related to a career in engineering technology. LA.B.2.4
 - 27.02 Explore career opportunities related to engineering technology.
LA.A.1.4, LA.A.2.4, LA.B.2.4
 - 27.03 Explore secondary education opportunities related to engineering technology. LA.A.1.4, LA.A.2.4, LA.B.2.4
 - 27.04 Conduct a job search. LA.A.1.4, LA.A.2.4
 - 27.05 Complete a job application form correctly. LA.B.2.4
 - 27.06 Demonstrate competence in job interview techniques. LA.C.1.4, LA.C.3.4, LA.D.1.4
 - 27.07 Create a professional resume and letter of introduction.
LA.A.1.4, LA.A.2.4, LA.B.1.4, LA.B.2.4
 - 27.08 Solicit awards, letters of recommendation and recognition.
LA.A.1.4, LA.A.2.4, LA.C.3.4, LA.D.1.4
 - 27.09 Organize work samples in a professional, presentable format.
LA.B.2.4, LA.C.3.4, LA.D.1.4
 - 27.10 Students will have an understanding of the difference between engineering disciplines and job functions.
 - 27.11 Students will understand the professional and legal responsibilities associated with being an engineer.
 - 27.12 Students will research and discover the educational requirements to become an engineer.
 - 27.13 Students will become familiar with an area of engineering by preparing for and conducting an interview with an engineer in that field of engineering.
- 29.0 COMMUNICATE DESIGN SOLUTIONS TO AN ENGINEERING PROBLEM--The student will be able to:
- 29.01 Students will compose sketches use proper sketching techniques in the solution of design problems.
 - 29.02 Students will select the appropriate sketching styles for presentation of a design problem to a group.
 - 29.03 Students will use proper proportioning while producing annotated sketches.
 - 29.04 Students will plan and compose a written technical report about the research they conduct about a career field in engineering.
 - 29.05 Students will be able to formulate an organized outline for a technical paper.

- 29.06 Students will be able to design and create tables, charts, and graphs to illustrate data they have collected.
 - 29.07 Students will evaluate and select an appropriate type of table, chart, or graph to accurately communicate collected data for written work or presentations.
 - 29.08 Students will create and assemble support materials to appropriately demonstrate concepts used in their presentations.
 - 29.09 Students will compose and diagram the product development lifecycle of an invention of their choice and report findings to the class.
 - 29.10 Students will give an oral presentation incorporating the first and second laws of thermodynamics, describing the concept and function of a heat engine of their choice.
 - 29.11 Students will demonstrate and defend their solution to the design problem in an oral presentation to the class.
 - 29.12 Students will create a flow diagram schematic sketch and compare it to an actual fluid power circuit during a presentation to the class.
 - 29.13 Students will create schematic drawings to facilitate experimental measurements of electrical circuits.
 - 29.14 Students will be able to use a computer aided engineering package to analyze a shape.
 - 29.15 The student will be able to formulate conclusions through analysis of recorded laboratory test data for presentations in the form of charts, graphs, written, verbal, and multi-media formats.
 - 29.16 Students will be able to analyze word problems about forces acting on materials.
- 30.0 APPLY MATHEMATICAL CONCEPTS IN THE SOLUTION OF ENGINEERING PROBLEMS.--
The student will be able to:
- 30.01 Students will mathematically analyze a simple truss to determine types and magnitude of forces supported in the truss.
 - 30.02 Students will mathematically explain the mechanical advantage gained and explain the function of the six different types of simple machines in a presentation on the SMET device.
 - 30.03 Students will mathematically calculate and explain the work being done by a specific fluid power device.
 - 30.04 Students will prepare and present a mathematical analysis of a truss design as part of a 5 minute oral presentation about their bridge design.
- 31.0 APPLY SCIENTIFIC CONCEPTS IN THE SOLUTION OF ENGINEERING PROBLEMS.--The student will be able to:
- 31.01 Students will apply ohm's and watt's laws in designing safe electrical circuits.
 - 31.02 Students will be able to estimate current consumption by a circuit and be able to compare estimates to accurate measurements they perform.
 - 31.03 Students will apply simple machines to create mechanical systems in the solution of a design problem.
 - 31.04 Demonstrate and apply principles of force, work, rate, resistance, energy, power, and force transformers relating to mechanical systems. SC.C.1.4, SC.C.2.4
 - 31.05 Students will conduct an energy analysis on a section of their home and calculate the heat loss through walls and windows.

- 31.06 Students will research and evaluate systems undergoing thermodynamic cycles for efficiency and present findings to the group.
- 31.07 Students will be able to define, describe and analyze the stresses and forces acting on an object.
- 31.08 Students will be able to explain the difference between the area of a cross section of an object and the second moment of the area (Moment of Inertia) and predict the relative strength of one shape vs. another.
- 31.09 Students will be able to identify and differentiate the five basic categories of solid engineering materials.
- 31.10 Students will be able to compare and contrast the physical properties of organic, metals, polymers, ceramics, and composites.

**Florida Department of Education
STUDENT PERFORMANCE STANDARDS**

Course Number: 8600530
Course Title: Digital Electronics
Course Credit: 1

COURSE DESCRIPTION: This is a course in applied logic that encompasses the application of electronic circuits and devices. Computer simulation software is used to design and test digital circuitry prior to the actual construction of circuits and devices.

01.0 DEMONSTRATE AN UNDERSTANDING OF THE CHARACTERISTICS AND SCOPE OF TECHNOLOGY--The student will be able to:

- 01.01 Conduct specific goal-directed research related to inventions and innovations. STL.1.L, LA.A.1.4, LA.A.2.4, LA.B.2.4
- 01.02 Evaluate current technological developments that are/were driven by profit motive and the market. STL.1.M, SS.D.1.4

02.0 DEMONSTRATE AN UNDERSTANDING OF THE CORE CONCEPTS OF TECHNOLOGY--The student will be able to:

- 02.01 Apply systems thinking logic and creativity with appropriate compromises in complex real-life problems. STL.2.W
- 02.02 Assess technological systems, which are the building blocks of technology and are embedded within larger technological, social, and environmental systems. STL.2.X, LA.D.2.4
- 02.03 Assess the stability of a technological system and its influence by all of the components in the system, especially those in the feedback loop. STL.2.Y
- 02.04 Compare resources involving trade-offs between competing values, such as availability, cost, desirability, and waste. STL.2.Z, SS.D.1.4
- 02.05 Identify the criteria and constraints of a product or system and determine how they affect the final design and development. STL.2.AA, MA.A.5.4, MA.B.1.4, MA.B.3.4, MA.B.4.4, MA.E.3.4, SC.H.1.4
- 02.06 Propose strategies for optimizing a technological process or methodology of designing or making a product, dependent on criteria and constraints. STL.2.BB
- 02.07 Discuss new technologies that create new processes. STL.2.CC
- 02.08 Recommend a quality control process to ensure that a product, service or system meets established criteria. STL.2.DD
- 02.09 Organize a management system as the process of planning, organizing, and controlling work. STL.2.EE
- 02.10 Outline complex systems that have many layers of controls and feedback loops to provide information. STL.2.FF

03.0 DEMONSTRATE AN UNDERSTANDING OF THE RELATIONSHIPS AMONG TECHNOLOGIES AND THE CONNECTION BETWEEN TECHNOLOGY AND OTHER FIELDS OF STUDY--The student will be able to:

- 03.01 Examine technology transfer occurring when a new user applies an existing innovation developed for one purpose in a different function. STL.3.G, SC.H.3.4

- 03.02 Examine technological innovation resulting when ideas, knowledge, or skills are shared within a technology, among technologies, or across other fields. STL.3.H, SC.H.3.4
- 03.03 Investigate technological progresses that promote the advancement of science and mathematics. STL.3.J, LA.A.1.4, LA.B.1.4, SC.H.3.4
- 04.0 DEMONSTRATE AN UNDERSTANDING OF THE CULTURAL, SOCIAL, ECONOMIC, AND POLITICAL EFFECTS OF TECHNOLOGY--The student will be able to:
- 04.01 Discuss changes caused by the use of technology ranging from gradual to rapid and from subtle to obvious. STL.4.H
- 04.02 Evaluate the use of technology involving weighing the trade-offs between the positive and the negative effects. STL.4.I, LA.B.2.4
- 04.03 Discuss ethical considerations important in the development, selection, and use of technologies. STL.4.J, SC.H.1.4, SS.C.2.4
- 04.04 Debate the cultural, social, economic, and political changes caused by the transfer of a technology from one society to another. STL.4.K, LA.B.2.4, LA.E.1.4, SC.H.3.4
- 05.0 DEMONSTRATE AN UNDERSTANDING OF THE EFFECTS OF TECHNOLOGY ON THE ENVIRONMENT--The student will be able to:
- 05.01 Consider trade-offs of developing technologies to reduce the use of resources. STL.5.H, SC.G.2.4, SS.D.1.4
- 05.02 Compare and contrast the alignment of technological processes with natural processes to maximize performance and reduce negative impacts on the environment. STL.5.J, SC.G.2.4, SS.B.2.4
- 05.03 Assess technologies devised to reduce the negative consequences of other technologies. STL.5.K
- 05.04 Make decisions about the implementation of technologies involving the weighing of trade-offs between predicted positive and negative effects on the environment. STL.5.L, SC.G.2.4, SC.H.3.4
- 06.0 DEMONSTRATE AN UNDERSTANDING OF THE ROLE OF SOCIETY IN THE DEVELOPMENT AND USE OF TECHNOLOGY--The student will be able to:
- 06.01 Consider societal opinions and demands, as well as corporate cultures to use as a basis for deciding whether or not to develop a technology. STL.6.I
- 06.02 Evaluate a number of different factors, such as advertising, the strength of the economy, the goals of a company, and the latest fads as contributors to shaping the design of and demand for various technologies. STL.6.J, LA.D.2.4, SS.A.1.4, SS.D.2.4
- 07.0 DEMONSTRATE AN UNDERSTANDING OF THE INFLUENCE OF TECHNOLOGY ON HISTORY--The student will be able to:
- 07.01 Assess how the evolution of civilization has been directly affected by, and has in turn affected, the development and use of tools and materials. STL.7.H, LA.A.1.4, LA.A.2.4, LA.B.2.4, SC.H.3.4, SS.A.2.4
- 07.02 Discuss the history of technology as a powerful force in reshaping the social, cultural, political, and economic landscape. STL.7.I, LA.D.2.4, SS.A.2.4

- 07.03 Describe the Iron Age as the use of iron and steel as the primary materials for tools. STL.7.K
 - 07.04 Discuss the Industrial Revolution and the development of continuous manufacturing, sophisticated transportation and communication systems, advanced construction practices, and improved education and leisure time. STL.7.N, SS.A.5.4
 - 07.05 Describe the Information Age and its placement of emphasis on the processing and exchange of information. STL.7.O, SS.A.5.4
- 08.0 DEMONSTRATE AN UNDERSTANDING OF THE ATTRIBUTES OF DESIGN--The student will be able to:
- 08.01 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. STL.8.H
 - 08.02 Translate design problems that are seldom presented in a clearly defined form. STL.8.I, LA.D.1.4, LA.D.2.4
 - 08.03 Evaluate a design continually, and improve and revise the idea of the design as needed. STL.8.J, SC.H.1.4
 - 08.04 Analyze competing requirements of a design, such as criteria, constraints, and efficiency. STL.8.K, MA.A.3.4, MA.B.1.4, MA.B.3.4, MA.B.4.4, MA.D.1.4, MA.D.2.4, MA.E.1.4
- 09.0 DEMONSTRATE AN UNDERSTANDING OF ENGINEERING DESIGN--The student will be able to:
- 09.01 Select design principles used to evaluate existing designs, to collect data, and to guide the design process. STL.9.I
 - 09.02 Examine the influence of personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly on the Engineering Design process. STL.9.J, LA.D.1.4, SC.H.1.4
 - 09.03 Construct a prototype or a working model used to test a design concept by making actual observations and necessary adjustments. STL.9.K, MA.B.1.4, SC.H.1.4, SC.H.3.4
 - 09.04 Evaluate factors taken into account in the process of engineering. STL.9.L
- 10.0 DEMONSTRATE AN UNDERSTANDING OF THE ROLE OF TROUBLESHOOTING, RESEARCH AND DEVELOPMENT, INVENTION AND INNOVATION, AND EXPERIMENTATION IN PROBLEM SOLVING--The student will be able to:
- 10.01 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. STL.10.I
 - 10.02 Conduct research needed to solve technological problems. STL.10.J, LA.A.1.4, LA.A.2.4
 - 10.03 Differentiate between technological and non-technological problems, and identify which problems can be solved using technology. STL.10.K, SC.H.1.4
 - 10.04 Utilize a multidisciplinary approach to solving technological problems. STL.10.L, MA.A.1.4, MA.A.3.4, MA.B.1.4, MA.B.3.4, MA.B.4.4, MA.E.1.4, MA.E.3.4, SC.H.1.4, SC.H.3.4

11.0 DEMONSTRATE THE ABILITIES TO APPLY THE DESIGN PROCESS--The student will be able to:

- 11.01 Interpret the design problem to solve and decide whether or not to address it. STL.11.M, SC.H.1.4
- 11.02 Evaluate criteria and constraints and determine how these will affect the design process. STL.11.N, MA.A.3.4, MA.B.1.4, MA.B.3.4, MA.B.4.4, MA.D.1.4, MA.D.2.4, MA.E.1.4, SC.H.1.4, SC.H.3.4
- 11.03 Refine a design by using prototypes and modeling to ensure quality, efficiency, and productivity of the final product. STL.11.O
- 11.04 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. STL.11.P, MA.A.4.4, MA.B.1.4, MA.B.3.4, MA.B.4.4, SC.H.1.4, SC.H.3.4
- 11.05 Produce a product or system using a design process. STL.11.Q
- 11.06 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. STL.11.R, LA.B.2.4, LA.C.3.4, MA.B.4.4, MA.D.2.4, MA.E.1.4, MA.E.2.4, MA.E.3.4, SC.H.1.4, SC.H.3.4

12.0 DEMONSTRATE THE ABILITIES TO USE AND MAINTAIN TECHNOLOGICAL PRODUCTS AND SYSTEMS--The student will be able to:

- 12.01 Document processes and procedures and communicate them to different audiences using appropriate oral and written techniques. STL.12.L, LA.B.1.4, LA.B.2.4, LA.C.3.4
- 12.02 Diagnose a system that is malfunctioning and use tools, materials, machines, and knowledge to repair it. STL.12.M
- 12.03 Troubleshoot, analyze, and maintain systems to ensure safe and proper function and precision. STL.12.N
- 12.04 Operate systems so that they function in the way they were designed. STL.12.O
- 12.05 Use computers and calculators to access, retrieve, organize, process, maintain, interpret, and evaluate data and information in order to communicate. STL.12.P, LA.A.2.4, MA.E.1.4

13.0 DEMONSTRATE THE ABILITIES TO ASSESS THE IMPACT OF PRODUCTS AND SYSTEMS--The student will be able to:

- 13.01 Collect information and evaluate its quality. STL.13.J, LA.A.2.4, SC.H.1.4
- 13.02 Synthesize data, analyze trends, and draw conclusions regarding the effect of technology on the individual, society, and the environment. STL.13.K, LA.A.2.4, SC.G.1.4, SC.G.2.4, SC.H.1.4
- 13.03 Apply assessment techniques, such as trend analysis and experimentation to make decisions about the future development of technology. STL.13.L, LA.A.2.4, MA.E.1.4, MA.E.2.4, MA.E.3.4
- 13.04 Design forecasting techniques to evaluate the results of altering natural systems. STL.13.M, MA.E.3.4, SC.G.2.4

16.0 DEMONSTRATE AN UNDERSTANDING OF AND BE ABLE TO SELECT AND USE ENERGY AND POWER TECHNOLOGIES--The student will be able to:

- 16.01 Discuss how energy cannot be created nor destroyed; however, it can be converted from one form to another. STL.16.J
 - 16.02 Categorize types of energy into major forms: thermal, radiant, electrical, mechanical, chemical, nuclear, and others. STL.16.K
 - 16.03 Classify energy resources as renewable or nonrenewable. STL.16.M
 - 16.04 Construct a power system having a source of energy, a process, and loads. STL.16.N
- 17.0 DEMONSTRATE AN UNDERSTANDING OF AND BE ABLE TO SELECT AND USE INFORMATION AND COMMUNICATION TECHNOLOGIES--The student will be able to:
- 17.01 Discuss information and communication technologies including the inputs, processes, and outputs associated with sending and receiving information. STL.17.L
 - 17.02 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. STL.17.M
 - 17.03 Use information and communication systems to inform, persuade, entertain, control, manage, and educate. STL.17.N
 - 17.04 Identify components of a communications system, including source, encoder, transmitter, receiver, decoder, storage, retrieval, and destination. STL.17.O
 - 17.05 Identify many ways to communicate information, such as graphic and electronic means. STL.17.P
 - 17.06 Communicate technological knowledge and processes using symbols, measurement, conventions, icons, graphic images, and languages that incorporate a variety of visual, auditory, and tactile stimuli. STL.17.Q
- 18.0 DEMONSTRATE AN UNDERSTANDING OF AND BE ABLE TO SELECT AND USE TRANSPORTATION TECHNOLOGIES--The student will be able to:
- 18.01 Analyze the vital role played by transportation in the operation of other technologies, such as manufacturing, construction, communication, health and safety, and agriculture. STL.18.J
 - 18.02 Define intermodalism as the use of different modes of transportation, such as highways, railways, and waterways as part of an interconnected system that can move people and goods easily from one mode to another. STL.18.K
 - 18.03 Discuss how transportation services and methods have led to a population that is regularly on the move. STL.18.L
 - 18.04 Identify processes and innovative techniques involved in the design of intelligent and non-intelligent transportation systems. STL.18.M
- 19.0 DEMONSTRATE AN UNDERSTANDING OF AND BE ABLE TO SELECT AND USE MANUFACTURING TECHNOLOGIES--The student will be able to:
- 19.01 Service products to keep them in good operating condition. STL.19.L
 - 19.02 Classify materials based on their qualities as natural, synthetic, or mixed. STL.19.M
 - 19.03 Classify goods as durable goods designed to operate for a long period of time, or non-durable goods designed to operate for a short period of time. STL.19.N

- 19.04 Identify and classify manufacturing systems into types, such as customized production, batch production, and continuous production. STL.19.0
 - 19.05 Discuss the interchangeability of parts to increase the effectiveness of manufacturing processes. STL.19.P
 - 19.06 Employ marketing techniques involving establishing a product's identity, conducting research on its potential, advertising it, distributing it, and selling it. STL.19.R
- 20.0 DEMONSTRATE AN UNDERSTANDING OF AND BE ABLE TO SELECT AND USE CONSTRUCTION TECHNOLOGIES--The student will be able to:
- 20.01 Define infrastructure as the underlying base or basic framework of a system. STL.20.J
 - 20.02 Identify a variety of processes and procedures used in constructing structures. STL.20.K
 - 20.03 Identify requirements involved in the design of structures. STL.20.L
 - 20.04 Recommend maintenance, alterations, or renovations to improve a structure or alter its intended use. STL.20.M
 - 20.05 Identify prefabricated materials used in some structures. STL.20.N
- 21.0 DEMONSTRATE SAFE AND APPROPRIATE USE OF TOOLS AND MACHINES IN ENGINEERING TECHNOLOGY--The student will be able to:
- 21.01 Select appropriate tools, procedures, and/or equipment.
 - 21.02 Demonstrate the safe usage of appropriate tools, procedures, and operation of equipment.
 - 21.03 Follow laboratory safety rules and procedures.
 - 21.04 Demonstrate good housekeeping at workstation within total laboratory.
 - 21.05 Identify color-coding safety standards.
 - 21.06 Explain fire prevention and safety precautions and practices for extinguishing fires.
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 - 22.02 Use or prepare budgets, make forecasts, keep records, and make adjustments to meet objectives. MA.B.3.4, MA.E.1.4
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 - 22.04 Display knowledge of the efficient use of human resources.
- 23.0 DEMONSTRATE THE FUNCTIONAL CHARACTERISTICS OF THE ENGINEERING DESIGN TEAM--The student will be able to:
- 23.01 Describe work breakdown organization.
 - 23.02 Describe work group organization schemes including functional and hierarchical schemes.
 - 23.03 Describe the function of management in general and project management in particular.

- 23.04 Describe a typical design project team structure.
 - 23.05 Outline a research methodology. LA.B.1.4
 - 23.06 Demonstrate brainstorming techniques. LA.B.1.4
- 24.0 DEMONSTRATE TECHNICAL KNOWLEDGE AND SKILLS IN THE PROCESSES AND SYSTEMS RELATED TO ENGINEERING--The student will be able to:
- 24.01 Assemble, operate, and identify the parts of a fluid system.
SC.C.1.4, SC.C.2.4, SC.H.3.4
 - 24.02 Demonstrate and apply principles of force, work, rate, resistance, energy, power, and force transformers relating to fluid systems. SC.C.1.4, SC.C.2.4
 - 24.03 Assemble, operate, and identify the parts of a thermal system.
SC.B.1.4, SC.B.2.4, SC.H.3.4
 - 24.04 Demonstrate and apply principles of force, work, rate, resistance, energy, power, and force transformers relating to thermal systems. SC.C.1.4, SC.C.2.4
 - 24.05 Assemble, operate, and identify the parts of an electrical system. SC.A.2.4, SC.C.2.4, SC.H.3.4
 - 24.06 Demonstrate and apply principles of force, work, rate, resistance, energy, power, and force transformers relating to electrical systems. SC.A.2.4, SC.C.1.4, SC.C.2.4
 - 24.07 Assemble, operate, and identify the parts of a mechanical system.
SC.C.1.4, SC.C.2.4, SC.H.3.4
 - 24.08 Demonstrate and apply principles of force, work, rate, resistance, energy, power, and force transformers relating to mechanical systems. SC.C.1.4, SC.C.2.4
- 25.0 DEMONSTRATE TECHNICAL KNOWLEDGE AND SKILLS IN THE DESIGNING, ENGINEERING, AND ANALYSIS OF CONSTRUCTED WORKS--The student will be able to:
- 25.01 Define terminology associated with engineering products, processes, and systems.
 - 25.02 Define and describe the experimental method as it is applied to design.
 - 25.03 Describe simulation.
 - 25.04 Prepare a model of a design solution to an engineering problem.
SC.H.3.4
 - 25.05 Prepare a graphical solution to an engineering problem. MA.D.2.4
 - 25.06 Prepare a mathematical solution to an engineering problem (using either a calculator or computer). MA.D.2.4
 - 25.07 Present a technical report on an engineering design problem, concept or issue. LA.C.3.4, LA.D.1.4
- 26.0 PERFORM ADVANCED STUDY AND TECHNICAL SKILLS RELATED TO ENGINEERING TECHNOLOGY--The student will be able to:
- 26.01 Identify an engineering problem or product for improvement using engineering design methodology.
 - 26.02 Develop a written plan of work for the engineering team to carry out the project. LA.B.1.4, LA.B.2.4
 - 26.03 Show evidence of technical research in support of the project.
LA.A.1.4, LA.A.2.4
 - 26.04 Perform skills related to the engineering project.
 - 26.05 Complete the project as planned.

- 26.06 Demonstrate the engineering design solution to a fluid system problem. LA.C.3.4
 - 26.07 Demonstrate the engineering design solution to an electrical system problem. LA.C.3.4
 - 26.08 Demonstrate the engineering design solution to a thermal system problem. LA.C.3.4
 - 26.09 Demonstrate and present the engineering design solution to a mechanical system problem. LA.A.1.4, LA.A.2.4, LA.C.3.4
 - 26.10 Formulate conclusions based on the analysis of engineered products. MA.B.4.4, MA.E.1.4, MA.E.3.4
- 27.0 DEMONSTRATE AN UNDERSTANDING OF CAREER OPPORTUNITIES AND REQUIREMENTS IN THE FIELD OF ENGINEERING TECHNOLOGY--The student will be able to:
- 27.01 Discuss individual interests related to a career in engineering technology. LA.B.2.4
 - 27.02 Explore career opportunities related to engineering technology. LA.A.1.4, LA.A.2.4, LA.B.2.4
 - 27.03 Explore secondary education opportunities related to engineering technology. LA.A.1.4, LA.A.2.4, LA.B.2.4
 - 27.04 Conduct a job search. LA.A.1.4, LA.A.2.4
 - 27.05 Complete a job application form correctly. LA.B.2.4
 - 27.06 Demonstrate competence in job interview techniques. LA.C.1.4, LA.C.3.4, LA.D.1.4
 - 27.07 Create a professional resume and letter of introduction. LA.A.1.4, LA.A.2.4, LA.B.1.4, LA.B.2.4
 - 27.08 Solicit awards, letters of recommendation and recognition. LA.A.1.4, LA.A.2.4, LA.C.3.4, LA.D.1.4
 - 27.09 Organize work samples in a professional, presentable format. LA.B.2.4, LA.C.3.4, LA.D.1.4

**Florida Department of Education
STUDENT PERFORMANCE STANDARDS**

Course Number: 8600550
Course Title: Introduction to Engineering Design
Course Credit: 1

COURSE DESCRIPTION: This course teaches problem-solving skills using a design development process. Models of product solutions are created, analyzed and communicated using solid modeling computer design software.

01.0 DEMONSTRATE AN UNDERSTANDING OF THE CHARACTERISTICS AND SCOPE OF TECHNOLOGY--The student will be able to:

- 01.01 Conduct specific goal-directed research related to inventions and innovations. STL.1.L, LA.A.1.4, LA.A.2.4, LA.B.2.4
- 01.02 Evaluate current technological developments that are/were driven by profit motive and the market. STL.1.M, SS.D.1.4
- 01.03 Research the chronological development and accelerating rate of change that innovations in tools and materials have brought about over time as it relates to a given consumer product.
- 01.04 Identify two innovations that have led to improved functionality of that tool.

02.0 DEMONSTRATE AN UNDERSTANDING OF THE CORE CONCEPTS OF TECHNOLOGY--The student will be able to:

- 02.01 Apply systems thinking logic and creativity with appropriate compromises in complex real-life problems. STL.2.W
- 02.02 Assess technological systems, which are the building blocks of technology and are embedded within larger technological, social, and environmental systems. STL.2.X, LA.D.2.4
- 02.03 Assess the stability of a technological system and its influence by all of the components in the system, especially those in the feedback loop. STL.2.Y
- 02.04 Compare resources involving trade-offs between competing values, such as availability, cost, desirability, and waste. STL.2.Z, SS.D.1.4
- 02.05 Identify the criteria and constraints of a product or system and determine how they affect the final design and development. STL.2.AA, MA.A.5.4, MA.B.1.4, MA.B.3.4, MA.B.4.4, MA.E.3.4, SC.H.1.4
- 02.06 Propose strategies for optimizing a technological process or methodology of designing or making a product, dependent on criteria and constraints. STL.2.BB
- 02.07 Discuss new technologies that create new processes. STL.2.CC
- 02.08 Recommend a quality control process to ensure that a product, service or system meets established criteria. STL.2.DD
- 02.09 Organize a management system as the process of planning, organizing, and controlling work. STL.2.EE
- 02.10 Outline complex systems that have many layers of controls and feedback loops to provide information. STL.2.FF

03.0 DEMONSTRATE AN UNDERSTANDING OF THE RELATIONSHIPS AMONG TECHNOLOGIES AND THE CONNECTION BETWEEN TECHNOLOGY AND OTHER FIELDS OF STUDY--The student will be able to:

- 03.01 Examine technology transfer occurring when a new user applies an existing innovation developed for one purpose in a different function. STL.3.G, SC.H.3.4
 - 03.02 Examine technological innovation resulting when ideas, knowledge, or skills are shared within a technology, among technologies, or across other fields. STL.3.H, SC.H.3.4
 - 03.03 Investigate technological progresses that promote the advancement of science and mathematics. STL.3.J, LA.A.1.4, LA.B.1.4, SC.H.3.4
- 04.0 DEMONSTRATE AN UNDERSTANDING OF THE CULTURAL, SOCIAL, ECONOMIC, AND POLITICAL EFFECTS OF TECHNOLOGY--The student will be able to:
- 04.01 Discuss changes caused by the use of technology ranging from gradual to rapid and from subtle to obvious. STL.4.H
 - 04.02 Evaluate the use of technology involving weighing the trade-offs between the positive and the negative effects. STL.4.I, LA.B.2.4
 - 04.03 Discuss ethical considerations important in the development, selection, and use of technologies. STL.4.J, SC.H.1.4, SS.C.2.4
 - 04.04 Debate the cultural, social, economic, and political changes caused by the transfer of a technology from one society to another. STL.4.K, LA.B.2.4, LA.E.1.4, SC.H.3.4
- 05.0 DEMONSTRATE AN UNDERSTANDING OF THE EFFECTS OF TECHNOLOGY ON THE ENVIRONMENT--The student will be able to:
- 05.01 Consider trade-offs of developing technologies to reduce the use of resources. STL.5.H, SC.G.2.4, SS.D.1.4
 - 05.02 Compare and contrast the alignment of technological processes with natural processes to maximize performance and reduce negative impacts on the environment. STL.5.J, SC.G.2.4, SS.B.2.4
 - 05.03 Assess technologies devised to reduce the negative consequences of other technologies. STL.5.K
 - 05.04 Make decisions about the implementation of technologies involving the weighing of trade-offs between predicted positive and negative effects on the environment. STL.5.L, SC.G.2.4, SC.H.3.4
- 06.0 DEMONSTRATE AN UNDERSTANDING OF THE ROLE OF SOCIETY IN THE DEVELOPMENT AND USE OF TECHNOLOGY--The student will be able to:
- 06.01 Consider societal opinions and demands, as well as corporate cultures to use as a basis for deciding whether or not to develop a technology. STL.6.I
 - 06.02 Evaluate a number of different factors, such as advertising, the strength of the economy, the goals of a company, and the latest fads as contributors to shaping the design of and demand for various technologies. STL.6.J, LA.D.2.4, SS.A.1.4, SS.D.2.4
 - 06.03 Research how artistic period and style have influenced product and architectural design.
- 07.0 DEMONSTRATE AN UNDERSTANDING OF THE INFLUENCE OF TECHNOLOGY ON HISTORY--The student will be able to:
- 07.01 Assess how the evolution of civilization has been directly affected by, and has in turn affected, the development and use of

- tools and materials. STL.7.H, LA.A.1.4, LA.A.2.4, LA.B.2.4, SC.H.3.4, SS.A.2.4
- 07.02 Discuss the history of technology as a powerful force in reshaping the social, cultural, political, and economic landscape. STL.7.I, LA.D.2.4, SS.A.2.4
- 07.03 Describe the Iron Age as the use of iron and steel as the primary materials for tools. STL.7.K
- 07.04 Discuss the Industrial Revolution and the development of continuous manufacturing, sophisticated transportation and communication systems, advanced construction practices, and improved education and leisure time. STL.7.N, SS.A.5.4
- 07.05 Describe the Information Age and its placement of emphasis on the processing and exchange of information. STL.7.O, SS.A.5.4
- 07.06 Explain how the history of art has influenced innovations in the field of engineering, and the impact of artistic expression as it relates to consumer products.
- 07.07 Explore the evolution of technology and be able to identify engineering achievements through history.
- 08.0 DEMONSTRATE AN UNDERSTANDING OF THE ATTRIBUTES OF DESIGN--The student will be able to:
- 08.01 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. STL.8.H
- 08.02 Translate design problems that are seldom presented in a clearly defined form. STL.8.I, LA.D.1.4, LA.D.2.4
- 08.03 Evaluate a design continually, and improve and revise the idea of the design as needed. STL.8.J, SC.H.1.4
- 08.04 Analyze competing requirements of a design, such as criteria, constraints, and efficiency. STL.8.K, MA.A.3.4, MA.B.1.4, MA.B.3.4, MA.B.4.4, MA.D.1.4, MA.D.2.4, MA.E.1.4
- 08.05 Explore the design concept of form and function and explain its use in product design.
- 08.06 List the seven steps of the design process and explain activities that occur during each phase.
- 08.07 Explain the importance of focusing on detail during the design process.
- 08.08 List the principles and elements of design and explain where they fit in to the design process.
- 08.09 Identify the use of the principles and elements of design in various products, print media, and art forms.
- 08.10 Collect and display examples of the application of the principles and elements of design utilized in products, print media, and art forms.
- 09.0 DEMONSTRATE AN UNDERSTANDING OF ENGINEERING DESIGN--The student will be able to:
- 09.01 Select design principles used to evaluate existing designs, to collect data, and to guide the design process. STL.9.I
- 09.02 Examine the influence of personal characteristics, such as creativity, resourcefulness, and the ability to visualize and

- think abstractly on the Engineering Design process. STL.9.J, LA.D.1.4, SC.H.1.4
- 09.03 Construct a prototype or a working model used to test a design concept by making actual observations and necessary adjustments. STL.9.K, MA.B.1.4, SC.H.1.4, SC.H.3.4
- 09.04 Evaluate factors taken into account in the process of engineering. STL.9.L
- 10.0 DEMONSTRATE AN UNDERSTANDING OF THE ROLE OF TROUBLESHOOTING, RESEARCH AND DEVELOPMENT, INVENTION AND INNOVATION, AND EXPERIMENTATION IN PROBLEM SOLVING--The student will be able to:
- 10.01 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. STL.10.I
- 10.02 Conduct research needed to solve technological problems. STL.10.J, LA.A.1.4, LA.A.2.4
- 10.03 Differentiate between technological and non-technological problems, and identify which problems can be solved using technology. STL.10.K, SC.H.1.4
- 10.04 Utilize a multidisciplinary approach to solving technological problems. STL.10.L, MA.A.1.4, MA.A.3.4, MA.B.1.4, MA.B.3.4, MA.B.4.4, MA.E.1.4, MA.E.3.4, SC.H.1.4, SC.H.3.4
- 11.0 DEMONSTRATE THE ABILITIES TO APPLY THE DESIGN PROCESS--The student will be able to:
- 11.01 Interpret the design problem to solve and decide whether or not to address it. STL.11.M, SC.H.1.4
- 11.02 Evaluate criteria and constraints and determine how these will affect the design process. STL.11.N, MA.A.3.4, MA.B.1.4, MA.B.3.4, MA.B.4.4, MA.D.1.4, MA.D.2.4, MA.E.1.4, SC.H.1.4, SC.H.3.4
- 11.03 Refine a design by using prototypes and modeling to ensure quality, efficiency, and productivity of the final product. STL.11.O
- 11.04 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. STL.11.P, MA.A.4.4, MA.B.1.4, MA.B.3.4, MA.B.4.4, SC.H.1.4, SC.H.3.4
- 11.05 Produce a product or system using a design process. STL.11.Q
- 11.06 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. STL.11.R, LA.B.2.4, LA.C.3.4, MA.B.4.4, MA.D.2.4, MA.E.1.4, MA.E.2.4, MA.E.3.4, SC.H.1.4, SC.H.3.4
- 11.07 Explain the difference between parametric and adaptive designs and their uses.
- 12.0 DEMONSTRATE THE ABILITIES TO USE AND MAINTAIN TECHNOLOGICAL PRODUCTS AND SYSTEMS--The student will be able to:
- 12.01 Document processes and procedures and communicate them to different audiences using appropriate oral and written techniques. STL.12.L, LA.B.1.4, LA.B.2.4, LA.C.3.4

- 12.02 Diagnose a system that is malfunctioning and use tools, materials, machines, and knowledge to repair it. STL.12.M
 - 12.03 Troubleshoot, analyze, and maintain systems to ensure safe and proper function and precision. STL.12.N
 - 12.04 Operate systems so that they function in the way they were designed. STL.12.O
 - 12.05 Use computers and calculators to access, retrieve, organize, process, maintain, interpret, and evaluate data and information in order to communicate. STL.12.P, LA.A.2.4, MA.E.1.4
- 13.0 DEMONSTRATE THE ABILITIES TO ASSESS THE IMPACT OF PRODUCTS AND SYSTEMS--
-The student will be able to:
- 13.01 Collect information and evaluate its quality. STL.13.J, LA.A.2.4, SC.H.1.4
 - 13.02 Synthesize data, analyze trends, and draw conclusions regarding the effect of technology on the individual, society, and the environment. STL.13.K, LA.A.2.4, SC.G.1.4, SC.G.2.4, SC.H.1.4
 - 13.03 Apply assessment techniques, such as trend analysis and experimentation to make decisions about the future development of technology. STL.13.L, LA.A.2.4, MA.E.1.4, MA.E.2.4, MA.E.3.4
 - 13.04 Design forecasting techniques to evaluate the results of altering natural systems. STL.13.M, MA.E.3.4, SC.G.2.4
- 16.0 DEMONSTRATE AN UNDERSTANDING OF AND BE ABLE TO SELECT AND USE ENERGY AND POWER TECHNOLOGIES--The student will be able to:
- 16.01 Discuss how energy cannot be created nor destroyed; however, it can be converted from one form to another. STL.16.J
 - 16.02 Categorize types of energy into major forms: thermal, radiant, electrical, mechanical, chemical, nuclear, and others. STL.16.K
 - 16.03 Classify energy resources as renewable or nonrenewable. STL.16.M
 - 16.04 Construct a power system having a source of energy, a process, and loads. STL.16.N
- 17.0 DEMONSTRATE AN UNDERSTANDING OF AND BE ABLE TO SELECT AND USE INFORMATION AND COMMUNICATION TECHNOLOGIES--The student will be able to:
- 17.01 Discuss information and communication technologies including the inputs, processes, and outputs associated with sending and receiving information. STL.17.L
 - 17.02 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. STL.17.M
 - 17.03 Use information and communication systems to inform, persuade, entertain, control, manage, and educate. STL.17.N
 - 17.04 Identify components of a communications system, including source, encoder, transmitter, receiver, decoder, storage, retrieval, and destination. STL.17.O
 - 17.05 Identify many ways to communicate information, such as graphic and electronic means. STL.17.P
 - 17.06 Communicate technological knowledge and processes using symbols, measurement, conventions, icons, graphic images, and languages that incorporate a variety of visual, auditory, and tactile stimuli. STL.17.Q

18.0 DEMONSTRATE AN UNDERSTANDING OF AND BE ABLE TO SELECT AND USE TRANSPORTATION TECHNOLOGIES--The student will be able to:

- 18.01 Analyze the vital role played by transportation in the operation of other technologies, such as manufacturing, construction, communication, health and safety, and agriculture. STL.18.J
- 18.02 Define intermodalism as the use of different modes of transportation, such as highways, railways, and waterways as part of an interconnected system that can move people and goods easily from one mode to another. STL.18.K
- 18.03 Discuss how transportation services and methods have led to a population that is regularly on the move. STL.18.L
- 18.04 Identify processes and innovative techniques involved in the design of intelligent and non-intelligent transportation systems. STL.18.M

19.0 DEMONSTRATE AN UNDERSTANDING OF AND BE ABLE TO SELECT AND USE MANUFACTURING TECHNOLOGIES--The student will be able to:

- 19.01 Service products to keep them in good operating condition. STL.19.L
- 19.02 Classify materials based on their qualities as natural, synthetic, or mixed. STL.19.M
- 19.03 Classify goods as durable goods designed to operate for a long period of time, or non-durable goods designed to operate for a short period of time. STL.19.N
- 19.04 Identify and classify manufacturing systems into types, such as customized production, batch production, and continuous production. STL.19.O
- 19.05 Discuss the interchangeability of parts to increase the effectiveness of manufacturing processes. STL.19.P
- 19.06 Employ marketing techniques involving establishing a product's identity, conducting research on its potential, advertising it, distributing it, and selling it. STL.19.R

20.0 DEMONSTRATE AN UNDERSTANDING OF AND BE ABLE TO SELECT AND USE CONSTRUCTION TECHNOLOGIES--The student will be able to:

- 20.01 Define infrastructure as the underlying base or basic framework of a system. STL.20.J
- 20.02 Identify a variety of processes and procedures used in constructing structures. STL.20.K
- 20.03 Identify requirements involved in the design of structures. STL.20.L
- 20.04 Recommend maintenance, alterations, or renovations to improve a structure or alter its intended use. STL.20.M
- 20.05 Identify prefabricated materials used in some structures. STL.20.N

21.0 DEMONSTRATE SAFE AND APPROPRIATE USE OF TOOLS AND MACHINES IN ENGINEERING TECHNOLOGY--The student will be able to:

- 21.01 Select appropriate tools, procedures, and/or equipment.
- 21.02 Demonstrate the safe usage of appropriate tools, procedures, and operation of equipment.
- 21.03 Follow laboratory safety rules and procedures.

- 21.04 Demonstrate good housekeeping at workstation within total laboratory.
 - 21.05 Identify color-coding safety standards.
 - 21.06 Explain fire prevention and safety precautions and practices for extinguishing fires.
 - 21.07 Identify harmful effects/potential dangers of familiar hazardous substances/devices to people and the environment.
- 22.0 DEMONSTRATE THE ABILITY TO PROPERLY IDENTIFY, ORGANIZE, PLAN, AND ALLOCATE RESOURCES--The student will be able to:
- 22.01 Demonstrate the ability to select goal-relevant activities, rank them, allocate time, and prepare and follow schedules.
 - 22.02 Use or prepare budgets, make forecasts, keep records, and make adjustments to meet objectives. MA.B.3.4, MA.E.1.4
 - 22.03 Demonstrate the ability to acquire, store, allocate, and use materials or space efficiently.
 - 22.04 Display knowledge of the efficient use of human resources.
- 23.0 DEMONSTRATE THE FUNCTIONAL CHARACTERISTICS OF THE ENGINEERING DESIGN TEAM--The student will be able to:
- 23.01 Describe work breakdown organization.
 - 23.02 Describe work group organization schemes including functional and hierarchical schemes.
 - 23.03 Describe the function of management in general and project management in particular.
 - 23.04 Describe a typical design project team structure.
 - 23.05 Outline a research methodology. LA.B.1.4
 - 23.06 Demonstrate brainstorming techniques. LA.B.1.4
 - 23.07 Explain the value of working well as a team and the benefits associated with such collaboration.
- 24.0 DEMONSTRATE TECHNICAL KNOWLEDGE AND SKILLS IN THE PROCESSES AND SYSTEMS RELATED TO ENGINEERING--The student will be able to:
- 24.01 Assemble, operate, and identify the parts of a fluid system. SC.C.1.4, SC.C.2.4, SC.H.3.4
 - 24.02 Demonstrate and apply principles of force, work, rate, resistance, energy, power, and force transformers relating to fluid systems. SC.C.1.4, SC.C.2.4
 - 24.03 Assemble, operate, and identify the parts of a thermal system. SC.B.1.4, SC.B.2.4, SC.H.3.4
 - 24.04 Demonstrate and apply principles of force, work, rate, resistance, energy, power, and force transformers relating to thermal systems. SC.C.1.4, SC.C.2.4
 - 24.05 Assemble, operate, and identify the parts of an electrical system. SC.A.2.4, SC.C.2.4, SC.H.3.4
 - 24.06 Demonstrate and apply principles of force, work, rate, resistance, energy, power, and force transformers relating to electrical systems. SC.A.2.4, SC.C.1.4, SC.C.2.4
 - 24.07 Assemble, operate, and identify the parts of a mechanical system. SC.C.1.4, SC.C.2.4, SC.H.3.4
 - 24.08 Demonstrate and apply principles of force, work, rate, resistance, energy, power, and force transformers relating to mechanical systems. SC.C.1.4, SC.C.2.4

- 25.0 DEMONSTRATE TECHNICAL KNOWLEDGE AND SKILLS IN THE DESIGNING, ENGINEERING, AND ANALYSIS OF CONSTRUCTED WORKS--The student will be able to:
- 25.01 Define terminology associated with engineering products, processes, and systems.
 - 25.02 Define and describe the experimental method as it is applied to design.
 - 25.03 Describe simulation.
 - 25.04 Prepare a model of a design solution to an engineering problem. SC.H.3.4
 - 25.05 Prepare a graphical solution to an engineering problem. MA.D.2.4
 - 25.06 Prepare a mathematical solution to an engineering problem (using either a calculator or computer). MA.D.2.4
 - 25.07 Use the correct format of analysis when analyzing a problem's solution.
 - 25.08 Present a technical report on an engineering design problem, concept or issue. LA.C.3.4, LA.D.1.4
- 26.0 PERFORM ADVANCED STUDY AND TECHNICAL SKILLS RELATED TO ENGINEERING TECHNOLOGY--The student will be able to:
- 26.01 Identify an engineering problem or product for improvement using engineering design methodology.
 - 26.02 Develop a written plan of work for the engineering team to carry out the project. LA.B.1.4, LA.B.2.4
 - 26.03 Show evidence of technical research in support of the project. LA.A.1.4, LA.A.2.4
 - 26.04 Perform skills related to the engineering project.
 - 26.05 Complete the project as planned.
 - 26.06 Demonstrate the engineering design solution to a fluid system problem. LA.C.3.4
 - 26.07 Demonstrate the engineering design solution to an electrical system problem. LA.C.3.4
 - 26.08 Demonstrate the engineering design solution to a thermal system problem. LA.C.3.4
 - 26.09 Demonstrate and present the engineering design solution to a mechanical system problem. LA.A.1.4, LA.A.2.4, LA.C.3.4
 - 26.10 Formulate conclusions based on the analysis of engineered products. MA.B.4.4, MA.E.1.4, MA.E.3.4
- 27.0 DEMONSTRATE AN UNDERSTANDING OF CAREER OPPORTUNITIES AND REQUIREMENTS IN THE FIELD OF ENGINEERING TECHNOLOGY--The student will be able to:
- 27.01 Discuss individual interests related to a career in engineering technology. LA.B.2.4
 - 27.02 Explore career opportunities related to engineering technology. LA.A.1.4, LA.A.2.4, LA.B.2.4
 - 27.03 Explore secondary education opportunities related to engineering technology. LA.A.1.4, LA.A.2.4, LA.B.2.4
 - 27.04 Conduct a job search. LA.A.1.4, LA.A.2.4
 - 27.05 Complete a job application form correctly. LA.B.2.4
 - 27.06 Demonstrate competence in job interview techniques. LA.C.1.4, LA.C.3.4, LA.D.1.4
 - 27.07 Create a professional resume and letter of introduction. LA.A.1.4, LA.A.2.4, LA.B.1.4, LA.B.2.4

- 27.08 Solicit awards, letters of recommendation and recognition.
LA.A.1.4, LA.A.2.4, LA.C.3.4, LA.D.1.4
- 27.09 Organize work samples in a professional, presentable format.
LA.B.2.4, LA.C.3.4, LA.D.1.4
- 27.10 Research and prepare a report that summarizes a professional organization and the range of services it provides.
- 27.11 Prepare a report on the career opportunities in a given engineering field, the job functions, and required educational requirements.

- 28.0 DEVELOP A DESIGN PORTFOLIO.--The student will be able to:
 - 28.01 Identify the proper elements of a fully developed portfolio.
 - 28.02 Identify and discuss the ethical issues surrounding portfolio artifacts.
 - 28.03 Create a design portfolio that is well organized and displays their work.

- 29.0 COMMUNICATE DESIGN SOLUTIONS TO AN ENGINEERING PROBLEM.--The student will be able to:
 - 29.01 Sketch solutions to a variety of design problems using the steps in the design process.
 - 29.02 Produce design sketches using proper sketching techniques and styles.
 - 29.03 Draw two-dimensional geometric figures.
 - 29.04 Explain the different pictorial styles of sketching and explain their usage.
 - 29.05 Create sketches that utilize both the additive and subtractive methods.
 - 29.06 Apply appropriate shading techniques in the creation of sketches.
 - 29.07 Evaluate and select the necessary views to graphically communicate design solutions.
 - 29.08 Interpret annotated sketches that accurately convey data in a design solution.
 - 29.09 Integrate annotated sketches in presentations, portfolio, and documentation process.
 - 29.10 Communicate their design ideas in written and verbal formats.
 - 29.11 Analyze and develop appropriate graphical representations of given data.
 - 29.12 Explain different physical modeling techniques.
 - 29.13 Build a scaled three-dimensional model.
 - 29.14 Generate a 3D model of a sketch using a computer CAD software package.
 - 29.15 Draw a 2D sketch using a CAD package.
 - 29.16 Apply geometric and dimensional constraints to a sketch.
 - 29.17 Modify a sketch or 3D model of a design solution.
 - 29.18 Create a 3D design assembly using a CAD program.
 - 29.19 Utilize part libraries during the assembly modeling process.
 - 29.20 Employ sub-assemblies in the production of assembly drawings.
 - 29.21 Apply drive constraints to simulate the motion of parts in assemblies.
 - 29.22 Compile mass properties from solid models.

- 30.0 APPLY MATHEMATICAL CONCEPTS IN THE SOLUTION OF ENGINEERING PROBLEMS.--The student will be able to:
 - 30.01 Define point, line, and line segment.

- 30.02 Identify major geometric shapes (isosceles triangle, right triangle, scalene triangle, rectangle, square, rhombus, trapezoid, pentagon, hexagon, and octagon).
- 30.03 Construct geometric shapes using a compass, ruler, and triangle.
- 30.04 Define the elements and types of angles.
- 30.05 Construct and bisect various types of angles.
- 30.06 Define what is meant by geometric constraints.
- 30.07 Define the following terms: horizontal, vertical, parallel, perpendicular, tangent, concentric, collinear, coincident, and equal.
- 30.08 Apply the right hand rule to correctly identify the x, y, and z axes of the Cartesian coordinate system.
- 30.09 Apply a combination of absolute, relative, and polar coordinates to construct a three-dimensional model.
- 30.10 Define the origin planes in the Cartesian coordinate system.
- 30.11 Identify the origin and planar orientations of each side of a three-dimensional model.
- 30.12 Compare and contrast vertical and lateral thinking.
- 30.13 Evaluate a problem using mathematical formulae.
- 30.14 List and explain the following terms usage in the evaluation of parametric models: volume, density, mass, surface area, centroid, moment of inertia, products of inertia, radii of gyration, principal axes, and principal moments.

**Florida Department of Education
STUDENT PERFORMANCE STANDARDS**

Course Number: 8600560
Course Title: Computer Integrated Manufacturing
Course Credit: 1

COURSE DESCRIPTION: This course applies principles of robotics and automation. The course builds on computer solid modeling skills developed in Introduction to Engineering Design, and Design and Drawing for Production. Students use CNC equipment to produce actual models of their three-dimensional designs. Fundamental concepts of robotics used in automated manufacturing, and design analysis are included.

01.0 DEMONSTRATE AN UNDERSTANDING OF THE CHARACTERISTICS AND SCOPE OF TECHNOLOGY--The student will be able to:

- 01.01 Conduct specific goal-directed research related to inventions and innovations. STL.1.L, LA.A.1.4, LA.A.2.4, LA.B.2.4
- 01.02 Evaluate current technological developments that are/were driven by profit motive and the market. STL.1.M, SS.D.1.4

02.0 DEMONSTRATE AN UNDERSTANDING OF THE CORE CONCEPTS OF TECHNOLOGY--The student will be able to:

- 02.01 Apply systems thinking logic and creativity with appropriate compromises in complex real-life problems. STL.2.W
- 02.02 Assess technological systems, which are the building blocks of technology and are embedded within larger technological, social, and environmental systems. STL.2.X, LA.D.2.4
- 02.03 Assess the stability of a technological system and its influence by all of the components in the system, especially those in the feedback loop. STL.2.Y
- 02.04 Compare resources involving trade-offs between competing values, such as availability, cost, desirability, and waste. STL.2.Z, SS.D.1.4
- 02.05 Identify the criteria and constraints of a product or system and determine how they affect the final design and development. STL.2.AA, MA.A.5.4, MA.B.1.4, MA.B.3.4, MA.B.4.4, MA.E.3.4, SC.H.1.4
- 02.06 Propose strategies for optimizing a technological process or methodology of designing or making a product, dependent on criteria and constraints. STL.2.BB
- 02.07 Discuss new technologies that create new processes. STL.2.CC
- 02.08 Recommend a quality control process to ensure that a product, service or system meets established criteria. STL.2.DD
- 02.09 Organize a management system as the process of planning, organizing, and controlling work. STL.2.EE
- 02.10 Outline complex systems that have many layers of controls and feedback loops to provide information. STL.2.FF

03.0 DEMONSTRATE AN UNDERSTANDING OF THE RELATIONSHIPS AMONG TECHNOLOGIES AND THE CONNECTION BETWEEN TECHNOLOGY AND OTHER FIELDS OF STUDY--The student will be able to:

- 03.01 Examine technology transfer occurring when a new user applies an existing innovation developed for one purpose in a different function. STL.3.G, SC.H.3.4
 - 03.02 Examine technological innovation resulting when ideas, knowledge, or skills are shared within a technology, among technologies, or across other fields. STL.3.H, SC.H.3.4
 - 03.03 Investigate technological progresses that promote the advancement of science and mathematics. STL.3.J, LA.A.1.4, LA.B.1.4, SC.H.3.4
- 04.0 DEMONSTRATE AN UNDERSTANDING OF THE CULTURAL, SOCIAL, ECONOMIC, AND POLITICAL EFFECTS OF TECHNOLOGY--The student will be able to:
- 04.01 Discuss changes caused by the use of technology ranging from gradual to rapid and from subtle to obvious. STL.4.H
 - 04.02 Evaluate the use of technology involving weighing the trade-offs between the positive and the negative effects. STL.4.I, LA.B.2.4
 - 04.03 Discuss ethical considerations important in the development, selection, and use of technologies. STL.4.J, SC.H.1.4, SS.C.2.4
 - 04.04 Debate the cultural, social, economic, and political changes caused by the transfer of a technology from one society to another. STL.4.K, LA.B.2.4, LA.E.1.4, SC.H.3.4
- 05.0 DEMONSTRATE AN UNDERSTANDING OF THE EFFECTS OF TECHNOLOGY ON THE ENVIRONMENT--The student will be able to:
- 05.01 Consider trade-offs of developing technologies to reduce the use of resources. STL.5.H, SC.G.2.4, SS.D.1.4
 - 05.02 Compare and contrast the alignment of technological processes with natural processes to maximize performance and reduce negative impacts on the environment. STL.5.J, SC.G.2.4, SS.B.2.4
 - 05.03 Assess technologies devised to reduce the negative consequences of other technologies. STL.5.K
 - 05.04 Make decisions about the implementation of technologies involving the weighing of trade-offs between predicted positive and negative effects on the environment. STL.5.L, SC.G.2.4, SC.H.3.4
- 06.0 DEMONSTRATE AN UNDERSTANDING OF THE ROLE OF SOCIETY IN THE DEVELOPMENT AND USE OF TECHNOLOGY--The student will be able to:
- 06.01 Consider societal opinions and demands, as well as corporate cultures to use as a basis for deciding whether or not to develop a technology. STL.6.I
 - 06.02 Evaluate a number of different factors, such as advertising, the strength of the economy, the goals of a company, and the latest fads as contributors to shaping the design of and demand for various technologies. STL.6.J, LA.D.2.4, SS.A.1.4, SS.D.2.4
- 07.0 DEMONSTRATE AN UNDERSTANDING OF THE INFLUENCE OF TECHNOLOGY ON HISTORY--The student will be able to:
- 07.01 Assess how the evolution of civilization has been directly affected by, and has in turn affected, the development and use of tools and materials. STL.7.H, LA.A.1.4, LA.A.2.4, LA.B.2.4, SC.H.3.4, SS.A.2.4

- 07.02 Discuss the history of technology as a powerful force in reshaping the social, cultural, political, and economic landscape. STL.7.I, LA.D.2.4, SS.A.2.4
 - 07.03 Describe the Iron Age as the use of iron and steel as the primary materials for tools. STL.7.K
 - 07.04 Discuss the Industrial Revolution and the development of continuous manufacturing, sophisticated transportation and communication systems, advanced construction practices, and improved education and leisure time. STL.7.N, SS.A.5.4
 - 07.05 Describe the Information Age and its placement of emphasis on the processing and exchange of information. STL.7.O, SS.A.5.4
- 08.0 DEMONSTRATE AN UNDERSTANDING OF THE ATTRIBUTES OF DESIGN--The student will be able to:
- 08.01 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. STL.8.H
 - 08.02 Translate design problems that are seldom presented in a clearly defined form. STL.8.I, LA.D.1.4, LA.D.2.4
 - 08.03 Evaluate a design continually, and improve and revise the idea of the design as needed. STL.8.J, SC.H.1.4
 - 08.04 Analyze competing requirements of a design, such as criteria, constraints, and efficiency. STL.8.K, MA.A.3.4, MA.B.1.4, MA.B.3.4, MA.B.4.4, MA.D.1.4, MA.D.2.4, MA.E.1.4
- 09.0 DEMONSTRATE AN UNDERSTANDING OF ENGINEERING DESIGN--The student will be able to:
- 09.01 Select design principles used to evaluate existing designs, to collect data, and to guide the design process. STL.9.I
 - 09.02 Examine the influence of personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly on the Engineering Design process. STL.9.J, LA.D.1.4, SC.H.1.4
 - 09.03 Construct a prototype or a working model used to test a design concept by making actual observations and necessary adjustments. STL.9.K, MA.B.1.4, SC.H.1.4, SC.H.3.4
 - 09.04 Evaluate factors taken into account in the process of engineering. STL.9.L
- 10.0 DEMONSTRATE AN UNDERSTANDING OF THE ROLE OF TROUBLESHOOTING, RESEARCH AND DEVELOPMENT, INVENTION AND INNOVATION, AND EXPERIMENTATION IN PROBLEM SOLVING--The student will be able to:
- 10.01 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. STL.10.I
 - 10.02 Conduct research needed to solve technological problems. STL.10.J, LA.A.1.4, LA.A.2.4
 - 10.03 Differentiate between technological and non-technological problems, and identify which problems can be solved using technology. STL.10.K, SC.H.1.4

- 10.04 Utilize a multidisciplinary approach to solving technological problems. STL.10.L, MA.A.1.4, MA.A.3.4, MA.B.1.4, MA.B.3.4, MA.B.4.4, MA.E.1.4, MA.E.3.4, SC.H.1.4, SC.H.3.4
- 11.0 DEMONSTRATE THE ABILITIES TO APPLY THE DESIGN PROCESS--The student will be able to:
- 11.01 Interpret the design problem to solve and decide whether or not to address it. STL.11.M, SC.H.1.4
- 11.02 Evaluate criteria and constraints and determine how these will affect the design process. STL.11.N, MA.A.3.4, MA.B.1.4, MA.B.3.4, MA.B.4.4, MA.D.1.4, MA.D.2.4, MA.E.1.4, SC.H.1.4, SC.H.3.4
- 11.03 Refine a design by using prototypes and modeling to ensure quality, efficiency, and productivity of the final product. STL.11.O
- 11.04 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. STL.11.P, MA.A.4.4, MA.B.1.4, MA.B.3.4, MA.B.4.4, SC.H.1.4, SC.H.3.4
- 11.05 Produce a product or system using a design process. STL.11.Q
- 11.06 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. STL.11.R, LA.B.2.4, LA.C.3.4, MA.B.4.4, MA.D.2.4, MA.E.1.4, MA.E.2.4, MA.E.3.4, SC.H.1.4, SC.H.3.4
- 12.0 DEMONSTRATE THE ABILITIES TO USE AND MAINTAIN TECHNOLOGICAL PRODUCTS AND SYSTEMS--The student will be able to:
- 12.01 Document processes and procedures and communicate them to different audiences using appropriate oral and written techniques. STL.12.L, LA.B.1.4, LA.B.2.4, LA.C.3.4
- 12.02 Diagnose a system that is malfunctioning and use tools, materials, machines, and knowledge to repair it. STL.12.M
- 12.03 Troubleshoot, analyze, and maintain systems to ensure safe and proper function and precision. STL.12.N
- 12.04 Operate systems so that they function in the way they were designed. STL.12.O
- 12.05 Use computers and calculators to access, retrieve, organize, process, maintain, interpret, and evaluate data and information in order to communicate. STL.12.P, LA.A.2.4, MA.E.1.4
- 13.0 DEMONSTRATE THE ABILITIES TO ASSESS THE IMPACT OF PRODUCTS AND SYSTEMS--The student will be able to:
- 13.01 Collect information and evaluate its quality. STL.13.J, LA.A.2.4, SC.H.1.4
- 13.02 Synthesize data, analyze trends, and draw conclusions regarding the effect of technology on the individual, society, and the environment. STL.13.K, LA.A.2.4, SC.G.1.4, SC.G.2.4, SC.H.1.4
- 13.03 Apply assessment techniques, such as trend analysis and experimentation to make decisions about the future development of technology. STL.13.L, LA.A.2.4, MA.E.1.4, MA.E.2.4, MA.E.3.4
- 13.04 Design forecasting techniques to evaluate the results of altering natural systems. STL.13.M, MA.E.3.4, SC.G.2.4

- 16.0 DEMONSTRATE AN UNDERSTANDING OF AND BE ABLE TO SELECT AND USE ENERGY AND POWER TECHNOLOGIES--The student will be able to:
- 16.01 Discuss how energy cannot be created nor destroyed; however, it can be converted from one form to another. STL.16.J
 - 16.02 Categorize types of energy into major forms: thermal, radiant, electrical, mechanical, chemical, nuclear, and others. STL.16.K
 - 16.03 Classify energy resources as renewable or nonrenewable. STL.16.M
 - 16.04 Construct a power system having a source of energy, a process, and loads. STL.16.N
- 17.0 DEMONSTRATE AN UNDERSTANDING OF AND BE ABLE TO SELECT AND USE INFORMATION AND COMMUNICATION TECHNOLOGIES--The student will be able to:
- 17.01 Discuss information and communication technologies including the inputs, processes, and outputs associated with sending and receiving information. STL.17.L
 - 17.02 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. STL.17.M
 - 17.03 Use information and communication systems to inform, persuade, entertain, control, manage, and educate. STL.17.N
 - 17.04 Identify components of a communications system, including source, encoder, transmitter, receiver, decoder, storage, retrieval, and destination. STL.17.O
 - 17.05 Identify many ways to communicate information, such as graphic and electronic means. STL.17.P
 - 17.06 Communicate technological knowledge and processes using symbols, measurement, conventions, icons, graphic images, and languages that incorporate a variety of visual, auditory, and tactile stimuli. STL.17.Q
- 18.0 DEMONSTRATE AN UNDERSTANDING OF AND BE ABLE TO SELECT AND USE TRANSPORTATION TECHNOLOGIES--The student will be able to:
- 18.01 Analyze the vital role played by transportation in the operation of other technologies, such as manufacturing, construction, communication, health and safety, and agriculture. STL.18.J
 - 18.02 Define intermodalism as the use of different modes of transportation, such as highways, railways, and waterways as part of an interconnected system that can move people and goods easily from one mode to another. STL.18.K
 - 18.03 Discuss how transportation services and methods have led to a population that is regularly on the move. STL.18.L
 - 18.04 Identify processes and innovative techniques involved in the design of intelligent and non-intelligent transportation systems. STL.18.M
- 19.0 DEMONSTRATE AN UNDERSTANDING OF AND BE ABLE TO SELECT AND USE MANUFACTURING TECHNOLOGIES--The student will be able to:
- 19.01 Service products to keep them in good operating condition. STL.19.L
 - 19.02 Classify materials based on their qualities as natural, synthetic, or mixed. STL.19.M

- 19.03 Classify goods as durable goods designed to operate for a long period of time, or non-durable goods designed to operate for a short period of time. STL.19.N
 - 19.04 Identify and classify manufacturing systems into types, such as customized production, batch production, and continuous production. STL.19.0
 - 19.05 Discuss the interchangeability of parts to increase the effectiveness of manufacturing processes. STL.19.P
 - 19.06 Employ marketing techniques involving establishing a product's identity, conducting research on its potential, advertising it, distributing it, and selling it. STL.19.R
- 20.0 DEMONSTRATE AN UNDERSTANDING OF AND BE ABLE TO SELECT AND USE CONSTRUCTION TECHNOLOGIES--The student will be able to:
- 20.01 Define infrastructure as the underlying base or basic framework of a system. STL.20.J
 - 20.02 Identify a variety of processes and procedures used in constructing structures. STL.20.K
 - 20.03 Identify requirements involved in the design of structures. STL.20.L
 - 20.04 Recommend maintenance, alterations, or renovations to improve a structure or alter its intended use. STL.20.M
 - 20.05 Identify prefabricated materials used in some structures. STL.20.N
- 21.0 DEMONSTRATE SAFE AND APPROPRIATE USE OF TOOLS AND MACHINES IN ENGINEERING TECHNOLOGY--The student will be able to:
- 21.01 Select appropriate tools, procedures, and/or equipment.
 - 21.02 Demonstrate the safe usage of appropriate tools, procedures, and operation of equipment.
 - 21.03 Follow laboratory safety rules and procedures.
 - 21.04 Demonstrate good housekeeping at workstation within total laboratory.
 - 21.05 Identify color-coding safety standards.
 - 21.06 Explain fire prevention and safety precautions and practices for extinguishing fires.
 - 21.07 Identify harmful effects/potential dangers of familiar hazardous substances/devices to people and the environment.
- 22.0 DEMONSTRATE THE ABILITY TO PROPERLY IDENTIFY, ORGANIZE, PLAN, AND ALLOCATE RESOURCES--The student will be able to:
- 22.01 Demonstrate the ability to select goal-relevant activities, rank them, allocate time, and prepare and follow schedules.
 - 22.02 Use or prepare budgets, make forecasts, keep records, and make adjustments to meet objectives. MA.B.3.4, MA.E.1.4
 - 22.03 Demonstrate the ability to acquire, store, allocate, and use materials or space efficiently.
 - 22.04 Display knowledge of the efficient use of human resources.
- 23.0 DEMONSTRATE THE FUNCTIONAL CHARACTERISTICS OF THE ENGINEERING DESIGN TEAM--The student will be able to:
- 23.01 Describe work breakdown organization.

- 23.02 Describe work group organization schemes including functional and hierarchical schemes.
 - 23.03 Describe the function of management in general and project management in particular.
 - 23.04 Describe a typical design project team structure.
 - 23.05 Outline a research methodology. LA.B.1.4
 - 23.06 Demonstrate brainstorming techniques. LA.B.1.4
- 24.0 DEMONSTRATE TECHNICAL KNOWLEDGE AND SKILLS IN THE PROCESSES AND SYSTEMS RELATED TO ENGINEERING--The student will be able to:
- 24.01 Assemble, operate, and identify the parts of a fluid system. SC.C.1.4, SC.C.2.4, SC.H.3.4
 - 24.02 Demonstrate and apply principles of force, work, rate, resistance, energy, power, and force transformers relating to fluid systems. SC.C.1.4, SC.C.2.4
 - 24.03 Assemble, operate, and identify the parts of a thermal system. SC.B.1.4, SC.B.2.4, SC.H.3.4
 - 24.04 Demonstrate and apply principles of force, work, rate, resistance, energy, power, and force transformers relating to thermal systems. SC.C.1.4, SC.C.2.4
 - 24.05 Assemble, operate, and identify the parts of an electrical system. SC.A.2.4, SC.C.2.4, SC.H.3.4
 - 24.06 Demonstrate and apply principles of force, work, rate, resistance, energy, power, and force transformers relating to electrical systems. SC.A.2.4, SC.C.1.4, SC.C.2.4
 - 24.07 Assemble, operate, and identify the parts of a mechanical system. SC.C.1.4, SC.C.2.4, SC.H.3.4
 - 24.08 Demonstrate and apply principles of force, work, rate, resistance, energy, power, and force transformers relating to mechanical systems. SC.C.1.4, SC.C.2.4
- 25.0 DEMONSTRATE TECHNICAL KNOWLEDGE AND SKILLS IN THE DESIGNING, ENGINEERING, AND ANALYSIS OF CONSTRUCTED WORKS--The student will be able to:
- 25.01 Define terminology associated with engineering products, processes, and systems.
 - 25.02 Define and describe the experimental method as it is applied to design.
 - 25.03 Describe simulation.
 - 25.04 Prepare a model of a design solution to an engineering problem. SC.H.3.4
 - 25.05 Prepare a graphical solution to an engineering problem. MA.D.2.4
 - 25.06 Prepare a mathematical solution to an engineering problem (using either a calculator or computer). MA.D.2.4
 - 25.07 Present a technical report on an engineering design problem, concept or issue. LA.C.3.4, LA.D.1.4
- 26.0 PERFORM ADVANCED STUDY AND TECHNICAL SKILLS RELATED TO ENGINEERING TECHNOLOGY--The student will be able to:
- 26.01 Identify an engineering problem or product for improvement using engineering design methodology.
 - 26.02 Develop a written plan of work for the engineering team to carry out the project. LA.B.1.4, LA.B.2.4

- 26.03 Show evidence of technical research in support of the project.
LA.A.1.4, LA.A.2.4
 - 26.04 Perform skills related to the engineering project.
 - 26.05 Complete the project as planned.
 - 26.06 Demonstrate the engineering design solution to a fluid system problem. LA.C.3.4
 - 26.07 Demonstrate the engineering design solution to an electrical system problem. LA.C.3.4
 - 26.08 Demonstrate the engineering design solution to a thermal system problem. LA.C.3.4
 - 26.09 Demonstrate and present the engineering design solution to a mechanical system problem. LA.A.1.4, LA.A.2.4, LA.C.3.4
 - 26.10 Formulate conclusions based on the analysis of engineered products. MA.B.4.4, MA.E.1.4, MA.E.3.4
- 27.0 DEMONSTRATE AN UNDERSTANDING OF CAREER OPPORTUNITIES AND REQUIREMENTS IN THE FIELD OF ENGINEERING TECHNOLOGY--The student will be able to:
- 27.01 Discuss individual interests related to a career in engineering technology. LA.B.2.4
 - 27.02 Explore career opportunities related to engineering technology.
LA.A.1.4, LA.A.2.4, LA.B.2.4
 - 27.03 Explore secondary education opportunities related to engineering technology. LA.A.1.4, LA.A.2.4, LA.B.2.4
 - 27.04 Conduct a job search. LA.A.1.4, LA.A.2.4
 - 27.05 Complete a job application form correctly. LA.B.2.4
 - 27.06 Demonstrate competence in job interview techniques. LA.C.1.4, LA.C.3.4, LA.D.1.4
 - 27.07 Create a professional resume and letter of introduction.
LA.A.1.4, LA.A.2.4, LA.B.1.4, LA.B.2.4
 - 27.08 Solicit awards, letters of recommendation and recognition.
LA.A.1.4, LA.A.2.4, LA.C.3.4, LA.D.1.4
 - 27.09 Organize work samples in a professional, presentable format.
LA.B.2.4, LA.C.3.4, LA.D.1.4

**Florida Department of Education
STUDENT PERFORMANCE STANDARDS**

Course Number: 8600590
Course Title: Civil Engineering and Architecture
Course Credit: 1

COURSE DESCRIPTION: This course provides an overview of the fields of Civil Engineering and Architecture, while emphasizing the interrelationship and dependence of both fields on each other. Students use state of the art software to solve real world problems and communicate solutions to hands-on projects and activities. This course covers topics such as the Roles of Civil Engineers and Architects, Project Planning, Site Planning, Building Design, and Project Documentation and Presentation..

01.0 DEMONSTRATE AN UNDERSTANDING OF THE CHARACTERISTICS AND SCOPE OF TECHNOLOGY--The student will be able to:

- 01.01 Conduct specific goal-directed research related to inventions and innovations. STL.1.L, LA.A.1.4, LA.A.2.4, LA.B.2.4
- 01.02 Evaluate current technological developments that are/were driven by profit motive and the market. STL.1.M, SS.D.1.4

02.0 DEMONSTRATE AN UNDERSTANDING OF THE CORE CONCEPTS OF TECHNOLOGY--The student will be able to:

- 02.01 Apply systems thinking logic and creativity with appropriate compromises in complex real-life problems. STL.2.W
- 02.02 Assess technological systems, which are the building blocks of technology and are embedded within larger technological, social, and environmental systems. STL.2.X, LA.D.2.4
- 02.03 Assess the stability of a technological system and its influence by all of the components in the system, especially those in the feedback loop. STL.2.Y
- 02.04 Compare resources involving trade-offs between competing values, such as availability, cost, desirability, and waste. STL.2.Z, SS.D.1.4
- 02.05 Identify the criteria and constraints of a product or system and determine how they affect the final design and development. STL.2.AA, MA.A.5.4, MA.B.1.4, MA.B.3.4, MA.B.4.4, MA.E.3.4, SC.H.1.4
- 02.06 Propose strategies for optimizing a technological process or methodology of designing or making a product, dependent on criteria and constraints. STL.2.BB
- 02.07 Discuss new technologies that create new processes. STL.2.CC
- 02.08 Recommend a quality control process to ensure that a product, service or system meets established criteria. STL.2.DD
- 02.09 Organize a management system as the process of planning, organizing, and controlling work. STL.2.EE
- 02.10 Outline complex systems that have many layers of controls and feedback loops to provide information. STL.2.FF

03.0 DEMONSTRATE AN UNDERSTANDING OF THE RELATIONSHIPS AMONG TECHNOLOGIES AND THE CONNECTION BETWEEN TECHNOLOGY AND OTHER FIELDS OF STUDY--The student will be able to:

- 03.01 Examine technology transfer occurring when a new user applies an existing innovation developed for one purpose in a different function. STL.3.G, SC.H.3.4
 - 03.02 Examine technological innovation resulting when ideas, knowledge, or skills are shared within a technology, among technologies, or across other fields. STL.3.H, SC.H.3.4
 - 03.03 Investigate technological progresses that promote the advancement of science and mathematics. STL.3.J, LA.A.1.4, LA.B.1.4, SC.H.3.4
- 04.0 DEMONSTRATE AN UNDERSTANDING OF THE CULTURAL, SOCIAL, ECONOMIC, AND POLITICAL EFFECTS OF TECHNOLOGY--The student will be able to:
- 04.01 Discuss changes caused by the use of technology ranging from gradual to rapid and from subtle to obvious. STL.4.H
 - 04.02 Evaluate the use of technology involving weighing the trade-offs between the positive and the negative effects. STL.4.I, LA.B.2.4
 - 04.03 Discuss ethical considerations important in the development, selection, and use of technologies. STL.4.J, SC.H.1.4, SS.C.2.4
 - 04.04 Debate the cultural, social, economic, and political changes caused by the transfer of a technology from one society to another. STL.4.K, LA.B.2.4, LA.E.1.4, SC.H.3.4
- 05.0 DEMONSTRATE AN UNDERSTANDING OF THE EFFECTS OF TECHNOLOGY ON THE ENVIRONMENT--The student will be able to:
- 05.01 Consider trade-offs of developing technologies to reduce the use of resources. STL.5.H, SC.G.2.4, SS.D.1.4
 - 05.02 Compare and contrast the alignment of technological processes with natural processes to maximize performance and reduce negative impacts on the environment. STL.5.J, SC.G.2.4, SS.B.2.4
 - 05.03 Assess technologies devised to reduce the negative consequences of other technologies. STL.5.K
 - 05.04 Make decisions about the implementation of technologies involving the weighing of trade-offs between predicted positive and negative effects on the environment. STL.5.L, SC.G.2.4, SC.H.3.4
- 06.0 DEMONSTRATE AN UNDERSTANDING OF THE ROLE OF SOCIETY IN THE DEVELOPMENT AND USE OF TECHNOLOGY--The student will be able to:
- 06.01 Consider societal opinions and demands, as well as corporate cultures to use as a basis for deciding whether or not to develop a technology. STL.6.I
 - 06.02 Evaluate a number of different factors, such as advertising, the strength of the economy, the goals of a company, and the latest fads as contributors to shaping the design of and demand for various technologies. STL.6.J, LA.D.2.4, SS.A.1.4, SS.D.2.4
- 07.0 DEMONSTRATE AN UNDERSTANDING OF THE INFLUENCE OF TECHNOLOGY ON HISTORY--The student will be able to:
- 07.01 Assess how the evolution of civilization has been directly affected by, and has in turn affected, the development and use of tools and materials. STL.7.H, LA.A.1.4, LA.A.2.4, LA.B.2.4, SC.H.3.4, SS.A.2.4

- 07.02 Discuss the history of technology as a powerful force in reshaping the social, cultural, political, and economic landscape. STL.7.I, LA.D.2.4, SS.A.2.4
 - 07.03 Describe the Iron Age as the use of iron and steel as the primary materials for tools. STL.7.K
 - 07.04 Discuss the Industrial Revolution and the development of continuous manufacturing, sophisticated transportation and communication systems, advanced construction practices, and improved education and leisure time. STL.7.N, SS.A.5.4
 - 07.05 Describe the Information Age and its placement of emphasis on the processing and exchange of information. STL.7.O, SS.A.5.4
- 08.0 DEMONSTRATE AN UNDERSTANDING OF THE ATTRIBUTES OF DESIGN--The student will be able to:
- 08.01 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. STL.8.H
 - 08.02 Translate design problems that are seldom presented in a clearly defined form. STL.8.I, LA.D.1.4, LA.D.2.4
 - 08.03 Evaluate a design continually, and improve and revise the idea of the design as needed. STL.8.J, SC.H.1.4
 - 08.04 Analyze competing requirements of a design, such as criteria, constraints, and efficiency. STL.8.K, MA.A.3.4, MA.B.1.4, MA.B.3.4, MA.B.4.4, MA.D.1.4, MA.D.2.4, MA.E.1.4
- 09.0 DEMONSTRATE AN UNDERSTANDING OF ENGINEERING DESIGN--The student will be able to:
- 09.01 Select design principles used to evaluate existing designs, to collect data, and to guide the design process. STL.9.I
 - 09.02 Examine the influence of personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly on the Engineering Design process. STL.9.J, LA.D.1.4, SC.H.1.4
 - 09.03 Construct a prototype or a working model used to test a design concept by making actual observations and necessary adjustments. STL.9.K, MA.B.1.4, SC.H.1.4, SC.H.3.4
 - 09.04 Evaluate factors taken into account in the process of engineering. STL.9.L
- 10.0 DEMONSTRATE AN UNDERSTANDING OF THE ROLE OF TROUBLESHOOTING, RESEARCH AND DEVELOPMENT, INVENTION AND INNOVATION, AND EXPERIMENTATION IN PROBLEM SOLVING--The student will be able to:
- 10.01 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. STL.10.I
 - 10.02 Conduct research needed to solve technological problems. STL.10.J, LA.A.1.4, LA.A.2.4
 - 10.03 Differentiate between technological and non-technological problems, and identify which problems can be solved using technology. STL.10.K, SC.H.1.4

- 10.04 Utilize a multidisciplinary approach to solving technological problems. STL.10.L, MA.A.1.4, MA.A.3.4, MA.B.1.4, MA.B.3.4, MA.B.4.4, MA.E.1.4, MA.E.3.4, SC.H.1.4, SC.H.3.4
- 11.0 DEMONSTRATE THE ABILITIES TO APPLY THE DESIGN PROCESS--The student will be able to:
- 11.01 Interpret the design problem to solve and decide whether or not to address it. STL.11.M, SC.H.1.4
- 11.02 Evaluate criteria and constraints and determine how these will affect the design process. STL.11.N, MA.A.3.4, MA.B.1.4, MA.B.3.4, MA.B.4.4, MA.D.1.4, MA.D.2.4, MA.E.1.4, SC.H.1.4, SC.H.3.4
- 11.03 Refine a design by using prototypes and modeling to ensure quality, efficiency, and productivity of the final product. STL.11.0
- 11.04 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. STL.11.P, MA.A.4.4, MA.B.1.4, MA.B.3.4, MA.B.4.4, SC.H.1.4, SC.H.3.4
- 11.05 Produce a product or system using a design process. STL.11.Q
- 11.06 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. STL.11.R, LA.B.2.4, LA.C.3.4, MA.B.4.4, MA.D.2.4, MA.E.1.4, MA.E.2.4, MA.E.3.4, SC.H.1.4, SC.H.3.4
- 12.0 DEMONSTRATE THE ABILITIES TO USE AND MAINTAIN TECHNOLOGICAL PRODUCTS AND SYSTEMS--The student will be able to:
- 12.01 Document processes and procedures and communicate them to different audiences using appropriate oral and written techniques. STL.12.L, LA.B.1.4, LA.B.2.4, LA.C.3.4
- 12.02 Diagnose a system that is malfunctioning and use tools, materials, machines, and knowledge to repair it. STL.12.M
- 12.03 Troubleshoot, analyze, and maintain systems to ensure safe and proper function and precision. STL.12.N
- 12.04 Operate systems so that they function in the way they were designed. STL.12.0
- 12.05 Use computers and calculators to access, retrieve, organize, process, maintain, interpret, and evaluate data and information in order to communicate. STL.12.P, LA.A.2.4, MA.E.1.4
- 13.0 DEMONSTRATE THE ABILITIES TO ASSESS THE IMPACT OF PRODUCTS AND SYSTEMS--The student will be able to:
- 13.01 Collect information and evaluate its quality. STL.13.J, LA.A.2.4, SC.H.1.4
- 13.02 Synthesize data, analyze trends, and draw conclusions regarding the effect of technology on the individual, society, and the environment. STL.13.K, LA.A.2.4, SC.G.1.4, SC.G.2.4, SC.H.1.4
- 13.03 Apply assessment techniques, such as trend analysis and experimentation to make decisions about the future development of technology. STL.13.L, LA.A.2.4, MA.E.1.4, MA.E.2.4, MA.E.3.4
- 13.04 Design forecasting techniques to evaluate the results of altering natural systems. STL.13.M, MA.E.3.4, SC.G.2.4

- 16.0 DEMONSTRATE AN UNDERSTANDING OF AND BE ABLE TO SELECT AND USE ENERGY AND POWER TECHNOLOGIES--The student will be able to:
- 16.01 Discuss how energy cannot be created nor destroyed; however, it can be converted from one form to another. STL.16.J
 - 16.02 Categorize types of energy into major forms: thermal, radiant, electrical, mechanical, chemical, nuclear, and others. STL.16.K
 - 16.03 Classify energy resources as renewable or nonrenewable. STL.16.M
 - 16.04 Construct a power system having a source of energy, a process, and loads. STL.16.N
- 17.0 DEMONSTRATE AN UNDERSTANDING OF AND BE ABLE TO SELECT AND USE INFORMATION AND COMMUNICATION TECHNOLOGIES--The student will be able to:
- 17.01 Discuss information and communication technologies including the inputs, processes, and outputs associated with sending and receiving information. STL.17.L
 - 17.02 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. STL.17.M
 - 17.03 Use information and communication systems to inform, persuade, entertain, control, manage, and educate. STL.17.N
 - 17.04 Identify components of a communications system, including source, encoder, transmitter, receiver, decoder, storage, retrieval, and destination. STL.17.O
 - 17.05 Identify many ways to communicate information, such as graphic and electronic means. STL.17.P
 - 17.06 Communicate technological knowledge and processes using symbols, measurement, conventions, icons, graphic images, and languages that incorporate a variety of visual, auditory, and tactile stimuli. STL.17.Q
- 18.0 DEMONSTRATE AN UNDERSTANDING OF AND BE ABLE TO SELECT AND USE TRANSPORTATION TECHNOLOGIES--The student will be able to:
- 18.01 Analyze the vital role played by transportation in the operation of other technologies, such as manufacturing, construction, communication, health and safety, and agriculture. STL.18.J
 - 18.02 Define intermodalism as the use of different modes of transportation, such as highways, railways, and waterways as part of an interconnected system that can move people and goods easily from one mode to another. STL.18.K
 - 18.03 Discuss how transportation services and methods have led to a population that is regularly on the move. STL.18.L
 - 18.04 Identify processes and innovative techniques involved in the design of intelligent and non-intelligent transportation systems. STL.18.M
- 19.0 DEMONSTRATE AN UNDERSTANDING OF AND BE ABLE TO SELECT AND USE MANUFACTURING TECHNOLOGIES--The student will be able to:
- 19.01 Service products to keep them in good operating condition. STL.19.L
 - 19.02 Classify materials based on their qualities as natural, synthetic, or mixed. STL.19.M

- 19.03 Classify goods as durable goods designed to operate for a long period of time, or non-durable goods designed to operate for a short period of time. STL.19.N
 - 19.04 Identify and classify manufacturing systems into types, such as customized production, batch production, and continuous production. STL.19.0
 - 19.05 Discuss the interchangeability of parts to increase the effectiveness of manufacturing processes. STL.19.P
 - 19.06 Employ marketing techniques involving establishing a product's identity, conducting research on its potential, advertising it, distributing it, and selling it. STL.19.R
- 20.0 DEMONSTRATE AN UNDERSTANDING OF AND BE ABLE TO SELECT AND USE CONSTRUCTION TECHNOLOGIES--The student will be able to:
- 20.01 Define infrastructure as the underlying base or basic framework of a system. STL.20.J
 - 20.02 Identify a variety of processes and procedures used in constructing structures. STL.20.K
 - 20.03 Identify requirements involved in the design of structures. STL.20.L
 - 20.04 Recommend maintenance, alterations, or renovations to improve a structure or alter its intended use. STL.20.M
 - 20.05 Identify prefabricated materials used in some structures. STL.20.N
- 21.0 DEMONSTRATE SAFE AND APPROPRIATE USE OF TOOLS AND MACHINES IN ENGINEERING TECHNOLOGY--The student will be able to:
- 21.01 Select appropriate tools, procedures, and/or equipment.
 - 21.02 Demonstrate the safe usage of appropriate tools, procedures, and operation of equipment.
 - 21.03 Follow laboratory safety rules and procedures.
 - 21.04 Demonstrate good housekeeping at workstation within total laboratory.
 - 21.05 Identify color-coding safety standards.
 - 21.06 Explain fire prevention and safety precautions and practices for extinguishing fires.
 - 21.07 Identify harmful effects/potential dangers of familiar hazardous substances/devices to people and the environment.
- 22.0 DEMONSTRATE THE ABILITY TO PROPERLY IDENTIFY, ORGANIZE, PLAN, AND ALLOCATE RESOURCES--The student will be able to:
- 22.01 Demonstrate the ability to select goal-relevant activities, rank them, allocate time, and prepare and follow schedules.
 - 22.02 Use or prepare budgets, make forecasts, keep records, and make adjustments to meet objectives. MA.B.3.4, MA.E.1.4
 - 22.03 Demonstrate the ability to acquire, store, allocate, and use materials or space efficiently.
 - 22.04 Display knowledge of the efficient use of human resources.
- 23.0 DEMONSTRATE THE FUNCTIONAL CHARACTERISTICS OF THE ENGINEERING DESIGN TEAM--The student will be able to:
- 23.01 Describe work breakdown organization.

- 23.02 Describe work group organization schemes including functional and hierarchical schemes.
 - 23.03 Describe the function of management in general and project management in particular.
 - 23.04 Describe a typical design project team structure.
 - 23.05 Outline a research methodology. LA.B.1.4
 - 23.06 Demonstrate brainstorming techniques. LA.B.1.4
- 24.0 DEMONSTRATE TECHNICAL KNOWLEDGE AND SKILLS IN THE PROCESSES AND SYSTEMS RELATED TO ENGINEERING--The student will be able to:
- 24.01 Assemble, operate, and identify the parts of a fluid system. SC.C.1.4, SC.C.2.4, SC.H.3.4
 - 24.02 Demonstrate and apply principles of force, work, rate, resistance, energy, power, and force transformers relating to fluid systems. SC.C.1.4, SC.C.2.4
 - 24.03 Assemble, operate, and identify the parts of a thermal system. SC.B.1.4, SC.B.2.4, SC.H.3.4
 - 24.04 Demonstrate and apply principles of force, work, rate, resistance, energy, power, and force transformers relating to thermal systems. SC.C.1.4, SC.C.2.4
 - 24.05 Assemble, operate, and identify the parts of an electrical system. SC.A.2.4, SC.C.2.4, SC.H.3.4
 - 24.06 Demonstrate and apply principles of force, work, rate, resistance, energy, power, and force transformers relating to electrical systems. SC.A.2.4, SC.C.1.4, SC.C.2.4
 - 24.07 Assemble, operate, and identify the parts of a mechanical system. SC.C.1.4, SC.C.2.4, SC.H.3.4
 - 24.08 Demonstrate and apply principles of force, work, rate, resistance, energy, power, and force transformers relating to mechanical systems. SC.C.1.4, SC.C.2.4
- 25.0 DEMONSTRATE TECHNICAL KNOWLEDGE AND SKILLS IN THE DESIGNING, ENGINEERING, AND ANALYSIS OF CONSTRUCTED WORKS--The student will be able to:
- 25.01 Define terminology associated with engineering products, processes, and systems.
 - 25.02 Define and describe the experimental method as it is applied to design.
 - 25.03 Describe simulation.
 - 25.04 Prepare a model of a design solution to an engineering problem. SC.H.3.4
 - 25.05 Prepare a graphical solution to an engineering problem. MA.D.2.4
 - 25.06 Prepare a mathematical solution to an engineering problem (using either a calculator or computer). MA.D.2.4
 - 25.07 Present a technical report on an engineering design problem, concept or issue. LA.C.3.4, LA.D.1.4
- 26.0 PERFORM ADVANCED STUDY AND TECHNICAL SKILLS RELATED TO ENGINEERING TECHNOLOGY--The student will be able to:
- 26.01 Identify an engineering problem or product for improvement using engineering design methodology.
 - 26.02 Develop a written plan of work for the engineering team to carry out the project. LA.B.1.4, LA.B.2.4

- 26.03 Show evidence of technical research in support of the project.
LA.A.1.4, LA.A.2.4
 - 26.04 Perform skills related to the engineering project.
 - 26.05 Complete the project as planned.
 - 26.06 Demonstrate the engineering design solution to a fluid system problem. LA.C.3.4
 - 26.07 Demonstrate the engineering design solution to an electrical system problem. LA.C.3.4
 - 26.08 Demonstrate the engineering design solution to a thermal system problem. LA.C.3.4
 - 26.09 Demonstrate and present the engineering design solution to a mechanical system problem. LA.A.1.4, LA.A.2.4, LA.C.3.4
 - 26.10 Formulate conclusions based on the analysis of engineered products. MA.B.4.4, MA.E.1.4, MA.E.3.4
- 27.0 DEMONSTRATE AN UNDERSTANDING OF CAREER OPPORTUNITIES AND REQUIREMENTS IN THE FIELD OF ENGINEERING TECHNOLOGY--The student will be able to:
- 27.01 Discuss individual interests related to a career in engineering technology. LA.B.2.4
 - 27.02 Explore career opportunities related to engineering technology.
LA.A.1.4, LA.A.2.4, LA.B.2.4
 - 27.03 Explore secondary education opportunities related to engineering technology. LA.A.1.4, LA.A.2.4, LA.B.2.4
 - 27.04 Conduct a job search. LA.A.1.4, LA.A.2.4
 - 27.05 Complete a job application form correctly. LA.B.2.4
 - 27.06 Demonstrate competence in job interview techniques. LA.C.1.4, LA.C.3.4, LA.D.1.4
 - 27.07 Create a professional resume and letter of introduction.
LA.A.1.4, LA.A.2.4, LA.B.1.4, LA.B.2.4
 - 27.08 Solicit awards, letters of recommendation and recognition.
LA.A.1.4, LA.A.2.4, LA.C.3.4, LA.D.1.4
 - 27.09 Organize work samples in a professional, presentable format.
LA.B.2.4, LA.C.3.4, LA.D.1.4

**Florida Department of Education
STUDENT PERFORMANCE STANDARDS**

Course Number: 8600620
Course Title: Aerospace Engineering
Course Credit: 1

COURSE DESCRIPTION: This course will introduce students to the world of aeronautics, flight, and engineering.

01.0 DEMONSTRATE AN UNDERSTANDING OF THE CHARACTERISTICS AND SCOPE OF TECHNOLOGY--The student will be able to:

- 01.01 Conduct specific goal-directed research related to inventions and innovations. STL.1.L, LA.A.1.4, LA.A.2.4, LA.B.2.4
- 01.02 Evaluate current technological developments that are/were driven by profit motive and the market. STL.1.M, SS.D.1.4

02.0 DEMONSTRATE AN UNDERSTANDING OF THE CORE CONCEPTS OF TECHNOLOGY--The student will be able to:

- 02.01 Apply systems thinking logic and creativity with appropriate compromises in complex real-life problems. STL.2.W
- 02.02 Assess technological systems, which are the building blocks of technology and are embedded within larger technological, social, and environmental systems. STL.2.X, LA.D.2.4
- 02.03 Assess the stability of a technological system and its influence by all of the components in the system, especially those in the feedback loop. STL.2.Y
- 02.04 Compare resources involving trade-offs between competing values, such as availability, cost, desirability, and waste. STL.2.Z, SS.D.1.4
- 02.05 Identify the criteria and constraints of a product or system and determine how they affect the final design and development. STL.2.AA, MA.A.5.4, MA.B.1.4, MA.B.3.4, MA.B.4.4, MA.E.3.4, SC.H.1.4
- 02.06 Propose strategies for optimizing a technological process or methodology of designing or making a product, dependent on criteria and constraints. STL.2.BB
- 02.07 Discuss new technologies that create new processes. STL.2.CC
- 02.08 Recommend a quality control process to ensure that a product, service or system meets established criteria. STL.2.DD
- 02.09 Organize a management system as the process of planning, organizing, and controlling work. STL.2.EE
- 02.10 Outline complex systems that have many layers of controls and feedback loops to provide information. STL.2.FF

03.0 DEMONSTRATE AN UNDERSTANDING OF THE RELATIONSHIPS AMONG TECHNOLOGIES AND THE CONNECTION BETWEEN TECHNOLOGY AND OTHER FIELDS OF STUDY--The student will be able to:

- 03.01 Examine technology transfer occurring when a new user applies an existing innovation developed for one purpose in a different function. STL.3.G, SC.H.3.4

- 03.02 Examine technological innovation resulting when ideas, knowledge, or skills are shared within a technology, among technologies, or across other fields. STL.3.H, SC.H.3.4
- 03.03 Investigate technological progresses that promote the advancement of science and mathematics. STL.3.J, LA.A.1.4, LA.B.1.4, SC.H.3.4
- 04.0 DEMONSTRATE AN UNDERSTANDING OF THE CULTURAL, SOCIAL, ECONOMIC, AND POLITICAL EFFECTS OF TECHNOLOGY--The student will be able to:
- 04.01 Discuss changes caused by the use of technology ranging from gradual to rapid and from subtle to obvious. STL.4.H
- 04.02 Evaluate the use of technology involving weighing the trade-offs between the positive and the negative effects. STL.4.I, LA.B.2.4
- 04.03 Discuss ethical considerations important in the development, selection, and use of technologies. STL.4.J, SC.H.1.4, SS.C.2.4
- 04.04 Debate the cultural, social, economic, and political changes caused by the transfer of a technology from one society to another. STL.4.K, LA.B.2.4, LA.E.1.4, SC.H.3.4
- 05.0 DEMONSTRATE AN UNDERSTANDING OF THE EFFECTS OF TECHNOLOGY ON THE ENVIRONMENT--The student will be able to:
- 05.01 Consider trade-offs of developing technologies to reduce the use of resources. STL.5.H, SC.G.2.4, SS.D.1.4
- 05.02 Compare and contrast the alignment of technological processes with natural processes to maximize performance and reduce negative impacts on the environment. STL.5.J, SC.G.2.4, SS.B.2.4
- 05.03 Assess technologies devised to reduce the negative consequences of other technologies. STL.5.K
- 05.04 Make decisions about the implementation of technologies involving the weighing of trade-offs between predicted positive and negative effects on the environment. STL.5.L, SC.G.2.4, SC.H.3.4
- 06.0 DEMONSTRATE AN UNDERSTANDING OF THE ROLE OF SOCIETY IN THE DEVELOPMENT AND USE OF TECHNOLOGY--The student will be able to:
- 06.01 Consider societal opinions and demands, as well as corporate cultures to use as a basis for deciding whether or not to develop a technology. STL.6.I
- 06.02 Evaluate a number of different factors, such as advertising, the strength of the economy, the goals of a company, and the latest fads as contributors to shaping the design of and demand for various technologies. STL.6.J, LA.D.2.4, SS.A.1.4, SS.D.2.4
- 07.0 DEMONSTRATE AN UNDERSTANDING OF THE INFLUENCE OF TECHNOLOGY ON HISTORY--The student will be able to:
- 07.01 Assess how the evolution of civilization has been directly affected by, and has in turn affected, the development and use of tools and materials. STL.7.H, LA.A.1.4, LA.A.2.4, LA.B.2.4, SC.H.3.4, SS.A.2.4
- 07.02 Discuss the history of technology as a powerful force in reshaping the social, cultural, political, and economic landscape. STL.7.I, LA.D.2.4, SS.A.2.4

- 07.03 Describe the Iron Age as the use of iron and steel as the primary materials for tools. STL.7.K
 - 07.04 Discuss the Industrial Revolution and the development of continuous manufacturing, sophisticated transportation and communication systems, advanced construction practices, and improved education and leisure time. STL.7.N, SS.A.5.4
 - 07.05 Describe the Information Age and its placement of emphasis on the processing and exchange of information. STL.7.O, SS.A.5.4
- 08.0 DEMONSTRATE AN UNDERSTANDING OF THE ATTRIBUTES OF DESIGN--The student will be able to:
- 08.01 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. STL.8.H
 - 08.02 Translate design problems that are seldom presented in a clearly defined form. STL.8.I, LA.D.1.4, LA.D.2.4
 - 08.03 Evaluate a design continually, and improve and revise the idea of the design as needed. STL.8.J, SC.H.1.4
 - 08.04 Analyze competing requirements of a design, such as criteria, constraints, and efficiency. STL.8.K, MA.A.3.4, MA.B.1.4, MA.B.3.4, MA.B.4.4, MA.D.1.4, MA.D.2.4, MA.E.1.4
- 09.0 DEMONSTRATE AN UNDERSTANDING OF ENGINEERING DESIGN--The student will be able to:
- 09.01 Select design principles used to evaluate existing designs, to collect data, and to guide the design process. STL.9.I
 - 09.02 Examine the influence of personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly on the Engineering Design process. STL.9.J, LA.D.1.4, SC.H.1.4
 - 09.03 Construct a prototype or a working model used to test a design concept by making actual observations and necessary adjustments. STL.9.K, MA.B.1.4, SC.H.1.4, SC.H.3.4
 - 09.04 Evaluate factors taken into account in the process of engineering. STL.9.L
- 10.0 DEMONSTRATE AN UNDERSTANDING OF THE ROLE OF TROUBLESHOOTING, RESEARCH AND DEVELOPMENT, INVENTION AND INNOVATION, AND EXPERIMENTATION IN PROBLEM SOLVING--The student will be able to:
- 10.01 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. STL.10.I
 - 10.02 Conduct research needed to solve technological problems. STL.10.J, LA.A.1.4, LA.A.2.4
 - 10.03 Differentiate between technological and non-technological problems, and identify which problems can be solved using technology. STL.10.K, SC.H.1.4
 - 10.04 Utilize a multidisciplinary approach to solving technological problems. STL.10.L, MA.A.1.4, MA.A.3.4, MA.B.1.4, MA.B.3.4, MA.B.4.4, MA.E.1.4, MA.E.3.4, SC.H.1.4, SC.H.3.4

11.0 DEMONSTRATE THE ABILITIES TO APPLY THE DESIGN PROCESS--The student will be able to:

- 11.01 Interpret the design problem to solve and decide whether or not to address it. STL.11.M, SC.H.1.4
- 11.02 Evaluate criteria and constraints and determine how these will affect the design process. STL.11.N, MA.A.3.4, MA.B.1.4, MA.B.3.4, MA.B.4.4, MA.D.1.4, MA.D.2.4, MA.E.1.4, SC.H.1.4, SC.H.3.4
- 11.03 Refine a design by using prototypes and modeling to ensure quality, efficiency, and productivity of the final product. STL.11.O
- 11.04 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. STL.11.P, MA.A.4.4, MA.B.1.4, MA.B.3.4, MA.B.4.4, SC.H.1.4, SC.H.3.4
- 11.05 Produce a product or system using a design process. STL.11.Q
- 11.06 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. STL.11.R, LA.B.2.4, LA.C.3.4, MA.B.4.4, MA.D.2.4, MA.E.1.4, MA.E.2.4, MA.E.3.4, SC.H.1.4, SC.H.3.4

12.0 DEMONSTRATE THE ABILITIES TO USE AND MAINTAIN TECHNOLOGICAL PRODUCTS AND SYSTEMS--The student will be able to:

- 12.01 Document processes and procedures and communicate them to different audiences using appropriate oral and written techniques. STL.12.L, LA.B.1.4, LA.B.2.4, LA.C.3.4
- 12.02 Diagnose a system that is malfunctioning and use tools, materials, machines, and knowledge to repair it. STL.12.M
- 12.03 Troubleshoot, analyze, and maintain systems to ensure safe and proper function and precision. STL.12.N
- 12.04 Operate systems so that they function in the way they were designed. STL.12.O
- 12.05 Use computers and calculators to access, retrieve, organize, process, maintain, interpret, and evaluate data and information in order to communicate. STL.12.P, LA.A.2.4, MA.E.1.4

13.0 DEMONSTRATE THE ABILITIES TO ASSESS THE IMPACT OF PRODUCTS AND SYSTEMS--The student will be able to:

- 13.01 Collect information and evaluate its quality. STL.13.J, LA.A.2.4, SC.H.1.4
- 13.02 Synthesize data, analyze trends, and draw conclusions regarding the effect of technology on the individual, society, and the environment. STL.13.K, LA.A.2.4, SC.G.1.4, SC.G.2.4, SC.H.1.4
- 13.03 Apply assessment techniques, such as trend analysis and experimentation to make decisions about the future development of technology. STL.13.L, LA.A.2.4, MA.E.1.4, MA.E.2.4, MA.E.3.4
- 13.04 Design forecasting techniques to evaluate the results of altering natural systems. STL.13.M, MA.E.3.4, SC.G.2.4

16.0 DEMONSTRATE AN UNDERSTANDING OF AND BE ABLE TO SELECT AND USE ENERGY AND POWER TECHNOLOGIES--The student will be able to:

- 16.01 Discuss how energy cannot be created nor destroyed; however, it can be converted from one form to another. STL.16.J
 - 16.02 Categorize types of energy into major forms: thermal, radiant, electrical, mechanical, chemical, nuclear, and others. STL.16.K
 - 16.03 Classify energy resources as renewable or nonrenewable. STL.16.M
 - 16.04 Construct a power system having a source of energy, a process, and loads. STL.16.N
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- 17.01 Discuss information and communication technologies including the inputs, processes, and outputs associated with sending and receiving information. STL.17.L
 - 17.02 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. STL.17.M
 - 17.03 Use information and communication systems to inform, persuade, entertain, control, manage, and educate. STL.17.N
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- 23.04 Describe a typical design project team structure.
 - 23.05 Outline a research methodology. LA.B.1.4
 - 23.06 Demonstrate brainstorming techniques. LA.B.1.4
- 24.0 DEMONSTRATE TECHNICAL KNOWLEDGE AND SKILLS IN THE PROCESSES AND SYSTEMS RELATED TO ENGINEERING--The student will be able to:
- 24.01 Assemble, operate, and identify the parts of a fluid system.
SC.C.1.4, SC.C.2.4, SC.H.3.4
 - 24.02 Demonstrate and apply principles of force, work, rate, resistance, energy, power, and force transformers relating to fluid systems. SC.C.1.4, SC.C.2.4
 - 24.03 Assemble, operate, and identify the parts of a thermal system.
SC.B.1.4, SC.B.2.4, SC.H.3.4
 - 24.04 Demonstrate and apply principles of force, work, rate, resistance, energy, power, and force transformers relating to thermal systems. SC.C.1.4, SC.C.2.4
 - 24.05 Assemble, operate, and identify the parts of an electrical system. SC.A.2.4, SC.C.2.4, SC.H.3.4
 - 24.06 Demonstrate and apply principles of force, work, rate, resistance, energy, power, and force transformers relating to electrical systems. SC.A.2.4, SC.C.1.4, SC.C.2.4
 - 24.07 Assemble, operate, and identify the parts of a mechanical system.
SC.C.1.4, SC.C.2.4, SC.H.3.4
 - 24.08 Demonstrate and apply principles of force, work, rate, resistance, energy, power, and force transformers relating to mechanical systems. SC.C.1.4, SC.C.2.4
- 25.0 DEMONSTRATE TECHNICAL KNOWLEDGE AND SKILLS IN THE DESIGNING, ENGINEERING, AND ANALYSIS OF CONSTRUCTED WORKS--The student will be able to:
- 25.01 Define terminology associated with engineering products, processes, and systems.
 - 25.02 Define and describe the experimental method as it is applied to design.
 - 25.03 Describe simulation.
 - 25.04 Prepare a model of a design solution to an engineering problem.
SC.H.3.4
 - 25.05 Prepare a graphical solution to an engineering problem. MA.D.2.4
 - 25.06 Prepare a mathematical solution to an engineering problem (using either a calculator or computer). MA.D.2.4
 - 25.07 Present a technical report on an engineering design problem, concept or issue. LA.C.3.4, LA.D.1.4
- 26.0 PERFORM ADVANCED STUDY AND TECHNICAL SKILLS RELATED TO ENGINEERING TECHNOLOGY--The student will be able to:
- 26.01 Identify an engineering problem or product for improvement using engineering design methodology.
 - 26.02 Develop a written plan of work for the engineering team to carry out the project. LA.B.1.4, LA.B.2.4
 - 26.03 Show evidence of technical research in support of the project.
LA.A.1.4, LA.A.2.4
 - 26.04 Perform skills related to the engineering project.
 - 26.05 Complete the project as planned.

- 26.06 Demonstrate the engineering design solution to a fluid system problem. LA.C.3.4
 - 26.07 Demonstrate the engineering design solution to an electrical system problem. LA.C.3.4
 - 26.08 Demonstrate the engineering design solution to a thermal system problem. LA.C.3.4
 - 26.09 Demonstrate and present the engineering design solution to a mechanical system problem. LA.A.1.4, LA.A.2.4, LA.C.3.4
 - 26.10 Formulate conclusions based on the analysis of engineered products. MA.B.4.4, MA.E.1.4, MA.E.3.4
- 27.0 DEMONSTRATE AN UNDERSTANDING OF CAREER OPPORTUNITIES AND REQUIREMENTS IN THE FIELD OF ENGINEERING TECHNOLOGY--The student will be able to:
- 27.01 Discuss individual interests related to a career in engineering technology. LA.B.2.4
 - 27.02 Explore career opportunities related to engineering technology. LA.A.1.4, LA.A.2.4, LA.B.2.4
 - 27.03 Explore secondary education opportunities related to engineering technology. LA.A.1.4, LA.A.2.4, LA.B.2.4
 - 27.04 Conduct a job search. LA.A.1.4, LA.A.2.4
 - 27.05 Complete a job application form correctly. LA.B.2.4
 - 27.06 Demonstrate competence in job interview techniques. LA.C.1.4, LA.C.3.4, LA.D.1.4
 - 27.07 Create a professional resume and letter of introduction. LA.A.1.4, LA.A.2.4, LA.B.1.4, LA.B.2.4
 - 27.08 Solicit awards, letters of recommendation and recognition. LA.A.1.4, LA.A.2.4, LA.C.3.4, LA.D.1.4
 - 27.09 Organize work samples in a professional, presentable format. LA.B.2.4, LA.C.3.4, LA.D.1.4

**Florida Department of Education
STUDENT PERFORMANCE STANDARDS**

Course Number: 8600630
Course Title: Biotechnical Engineering
Course Credit: 1

COURSE DESCRIPTION: This course applies and concurrently develops secondary level knowledge and skills in biology, physics, technology, and mathematics. It includes experiences from the diverse fields of Bio-technology, Bio-engineering, Bio-medical engineering, and Bio-molecular engineering.

- 01.0 DEMONSTRATE AN UNDERSTANDING OF THE CHARACTERISTICS AND SCOPE OF TECHNOLOGY--The student will be able to:
- 01.01 Conduct specific goal-directed research related to inventions and innovations. STL.1.L, LA.A.1.4, LA.A.2.4, LA.B.2.4
 - 01.02 Evaluate current technological developments that are/were driven by profit motive and the market. STL.1.M, SS.D.1.4
- 02.0 DEMONSTRATE AN UNDERSTANDING OF THE CORE CONCEPTS OF TECHNOLOGY--The student will be able to:
- 02.01 Apply systems thinking logic and creativity with appropriate compromises in complex real-life problems. STL.2.W
 - 02.02 Assess technological systems, which are the building blocks of technology and are embedded within larger technological, social, and environmental systems. STL.2.X, LA.D.2.4
 - 02.03 Assess the stability of a technological system and its influence by all of the components in the system, especially those in the feedback loop. STL.2.Y
 - 02.04 Compare resources involving trade-offs between competing values, such as availability, cost, desirability, and waste. STL.2.Z, SS.D.1.4
 - 02.05 Identify the criteria and constraints of a product or system and determine how they affect the final design and development. STL.2.AA, MA.A.5.4, MA.B.1.4, MA.B.3.4, MA.B.4.4, MA.E.3.4, SC.H.1.4
 - 02.06 Propose strategies for optimizing a technological process or methodology of designing or making a product, dependent on criteria and constraints. STL.2.BB
 - 02.07 Discuss new technologies that create new processes. STL.2.CC
 - 02.08 Recommend a quality control process to ensure that a product, service or system meets established criteria. STL.2.DD
 - 02.09 Organize a management system as the process of planning, organizing, and controlling work. STL.2.EE
 - 02.10 Outline complex systems that have many layers of controls and feedback loops to provide information. STL.2.FF
- 03.0 DEMONSTRATE AN UNDERSTANDING OF THE RELATIONSHIPS AMONG TECHNOLOGIES AND THE CONNECTION BETWEEN TECHNOLOGY AND OTHER FIELDS OF STUDY--The student will be able to:
- 03.01 Examine technology transfer occurring when a new user applies an existing innovation developed for one purpose in a different function. STL.3.G, SC.H.3.4

- 03.02 Examine technological innovation resulting when ideas, knowledge, or skills are shared within a technology, among technologies, or across other fields. STL.3.H, SC.H.3.4
- 03.03 Investigate technological progresses that promote the advancement of science and mathematics. STL.3.J, LA.A.1.4, LA.B.1.4, SC.H.3.4
- 04.0 DEMONSTRATE AN UNDERSTANDING OF THE CULTURAL, SOCIAL, ECONOMIC, AND POLITICAL EFFECTS OF TECHNOLOGY--The student will be able to:
- 04.01 Discuss changes caused by the use of technology ranging from gradual to rapid and from subtle to obvious. STL.4.H
- 04.02 Evaluate the use of technology involving weighing the trade-offs between the positive and the negative effects. STL.4.I, LA.B.2.4
- 04.03 Discuss ethical considerations important in the development, selection, and use of technologies. STL.4.J, SC.H.1.4, SS.C.2.4
- 04.04 Debate the cultural, social, economic, and political changes caused by the transfer of a technology from one society to another. STL.4.K, LA.B.2.4, LA.E.1.4, SC.H.3.4
- 05.0 DEMONSTRATE AN UNDERSTANDING OF THE EFFECTS OF TECHNOLOGY ON THE ENVIRONMENT--The student will be able to:
- 05.01 Consider trade-offs of developing technologies to reduce the use of resources. STL.5.H, SC.G.2.4, SS.D.1.4
- 05.02 Compare and contrast the alignment of technological processes with natural processes to maximize performance and reduce negative impacts on the environment. STL.5.J, SC.G.2.4, SS.B.2.4
- 05.03 Assess technologies devised to reduce the negative consequences of other technologies. STL.5.K
- 05.04 Make decisions about the implementation of technologies involving the weighing of trade-offs between predicted positive and negative effects on the environment. STL.5.L, SC.G.2.4, SC.H.3.4
- 06.0 DEMONSTRATE AN UNDERSTANDING OF THE ROLE OF SOCIETY IN THE DEVELOPMENT AND USE OF TECHNOLOGY--The student will be able to:
- 06.01 Consider societal opinions and demands, as well as corporate cultures to use as a basis for deciding whether or not to develop a technology. STL.6.I
- 06.02 Evaluate a number of different factors, such as advertising, the strength of the economy, the goals of a company, and the latest fads as contributors to shaping the design of and demand for various technologies. STL.6.J, LA.D.2.4, SS.A.1.4, SS.D.2.4
- 07.0 DEMONSTRATE AN UNDERSTANDING OF THE INFLUENCE OF TECHNOLOGY ON HISTORY--The student will be able to:
- 07.01 Assess how the evolution of civilization has been directly affected by, and has in turn affected, the development and use of tools and materials. STL.7.H, LA.A.1.4, LA.A.2.4, LA.B.2.4, SC.H.3.4, SS.A.2.4
- 07.02 Discuss the history of technology as a powerful force in reshaping the social, cultural, political, and economic landscape. STL.7.I, LA.D.2.4, SS.A.2.4

- 07.03 Describe the Iron Age as the use of iron and steel as the primary materials for tools. STL.7.K
 - 07.04 Discuss the Industrial Revolution and the development of continuous manufacturing, sophisticated transportation and communication systems, advanced construction practices, and improved education and leisure time. STL.7.N, SS.A.5.4
 - 07.05 Describe the Information Age and its placement of emphasis on the processing and exchange of information. STL.7.O, SS.A.5.4
- 08.0 DEMONSTRATE AN UNDERSTANDING OF THE ATTRIBUTES OF DESIGN--The student will be able to:
- 08.01 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. STL.8.H
 - 08.02 Translate design problems that are seldom presented in a clearly defined form. STL.8.I, LA.D.1.4, LA.D.2.4
 - 08.03 Evaluate a design continually, and improve and revise the idea of the design as needed. STL.8.J, SC.H.1.4
 - 08.04 Analyze competing requirements of a design, such as criteria, constraints, and efficiency. STL.8.K, MA.A.3.4, MA.B.1.4, MA.B.3.4, MA.B.4.4, MA.D.1.4, MA.D.2.4, MA.E.1.4
- 09.0 DEMONSTRATE AN UNDERSTANDING OF ENGINEERING DESIGN--The student will be able to:
- 09.01 Select design principles used to evaluate existing designs, to collect data, and to guide the design process. STL.9.I
 - 09.02 Examine the influence of personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly on the Engineering Design process. STL.9.J, LA.D.1.4, SC.H.1.4
 - 09.03 Construct a prototype or a working model used to test a design concept by making actual observations and necessary adjustments. STL.9.K, MA.B.1.4, SC.H.1.4, SC.H.3.4
 - 09.04 Evaluate factors taken into account in the process of engineering. STL.9.L
- 10.0 DEMONSTRATE AN UNDERSTANDING OF THE ROLE OF TROUBLESHOOTING, RESEARCH AND DEVELOPMENT, INVENTION AND INNOVATION, AND EXPERIMENTATION IN PROBLEM SOLVING--The student will be able to:
- 10.01 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. STL.10.I
 - 10.02 Conduct research needed to solve technological problems. STL.10.J, LA.A.1.4, LA.A.2.4
 - 10.03 Differentiate between technological and non-technological problems, and identify which problems can be solved using technology. STL.10.K, SC.H.1.4
 - 10.04 Utilize a multidisciplinary approach to solving technological problems. STL.10.L, MA.A.1.4, MA.A.3.4, MA.B.1.4, MA.B.3.4, MA.B.4.4, MA.E.1.4, MA.E.3.4, SC.H.1.4, SC.H.3.4

- 11.0 DEMONSTRATE THE ABILITIES TO APPLY THE DESIGN PROCESS--The student will be able to:
- 11.01 Interpret the design problem to solve and decide whether or not to address it. STL.11.M, SC.H.1.4
 - 11.02 Evaluate criteria and constraints and determine how these will affect the design process. STL.11.N, MA.A.3.4, MA.B.1.4, MA.B.3.4, MA.B.4.4, MA.D.1.4, MA.D.2.4, MA.E.1.4, SC.H.1.4, SC.H.3.4
 - 11.03 Refine a design by using prototypes and modeling to ensure quality, efficiency, and productivity of the final product. STL.11.O
 - 11.04 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. STL.11.P, MA.A.4.4, MA.B.1.4, MA.B.3.4, MA.B.4.4, SC.H.1.4, SC.H.3.4
 - 11.05 Produce a product or system using a design process. STL.11.Q
 - 11.06 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. STL.11.R, LA.B.2.4, LA.C.3.4, MA.B.4.4, MA.D.2.4, MA.E.1.4, MA.E.2.4, MA.E.3.4, SC.H.1.4, SC.H.3.4
- 12.0 DEMONSTRATE THE ABILITIES TO USE AND MAINTAIN TECHNOLOGICAL PRODUCTS AND SYSTEMS--The student will be able to:
- 12.01 Document processes and procedures and communicate them to different audiences using appropriate oral and written techniques. STL.12.L, LA.B.1.4, LA.B.2.4, LA.C.3.4
 - 12.02 Diagnose a system that is malfunctioning and use tools, materials, machines, and knowledge to repair it. STL.12.M
 - 12.03 Troubleshoot, analyze, and maintain systems to ensure safe and proper function and precision. STL.12.N
 - 12.04 Operate systems so that they function in the way they were designed. STL.12.O
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 - 21.02 Demonstrate the safe usage of appropriate tools, procedures, and operation of equipment.
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- 24.01 Assemble, operate, and identify the parts of a fluid system.
SC.C.1.4, SC.C.2.4, SC.H.3.4
 - 24.02 Demonstrate and apply principles of force, work, rate, resistance, energy, power, and force transformers relating to fluid systems. SC.C.1.4, SC.C.2.4
 - 24.03 Assemble, operate, and identify the parts of a thermal system.
SC.B.1.4, SC.B.2.4, SC.H.3.4
 - 24.04 Demonstrate and apply principles of force, work, rate, resistance, energy, power, and force transformers relating to thermal systems. SC.C.1.4, SC.C.2.4
 - 24.05 Assemble, operate, and identify the parts of an electrical system. SC.A.2.4, SC.C.2.4, SC.H.3.4
 - 24.06 Demonstrate and apply principles of force, work, rate, resistance, energy, power, and force transformers relating to electrical systems. SC.A.2.4, SC.C.1.4, SC.C.2.4
 - 24.07 Assemble, operate, and identify the parts of a mechanical system.
SC.C.1.4, SC.C.2.4, SC.H.3.4
 - 24.08 Demonstrate and apply principles of force, work, rate, resistance, energy, power, and force transformers relating to mechanical systems. SC.C.1.4, SC.C.2.4
- 25.0 DEMONSTRATE TECHNICAL KNOWLEDGE AND SKILLS IN THE DESIGNING, ENGINEERING, AND ANALYSIS OF CONSTRUCTED WORKS--The student will be able to:
- 25.01 Define terminology associated with engineering products, processes, and systems.
 - 25.02 Define and describe the experimental method as it is applied to design.
 - 25.03 Describe simulation.
 - 25.04 Prepare a model of a design solution to an engineering problem.
SC.H.3.4
 - 25.05 Prepare a graphical solution to an engineering problem. MA.D.2.4
 - 25.06 Prepare a mathematical solution to an engineering problem (using either a calculator or computer). MA.D.2.4
 - 25.07 Present a technical report on an engineering design problem, concept or issue. LA.C.3.4, LA.D.1.4
- 26.0 PERFORM ADVANCED STUDY AND TECHNICAL SKILLS RELATED TO ENGINEERING TECHNOLOGY--The student will be able to:
- 26.01 Identify an engineering problem or product for improvement using engineering design methodology.
 - 26.02 Develop a written plan of work for the engineering team to carry out the project. LA.B.1.4, LA.B.2.4
 - 26.03 Show evidence of technical research in support of the project.
LA.A.1.4, LA.A.2.4
 - 26.04 Perform skills related to the engineering project.
 - 26.05 Complete the project as planned.

- 26.06 Demonstrate the engineering design solution to a fluid system problem. LA.C.3.4
 - 26.07 Demonstrate the engineering design solution to an electrical system problem. LA.C.3.4
 - 26.08 Demonstrate the engineering design solution to a thermal system problem. LA.C.3.4
 - 26.09 Demonstrate and present the engineering design solution to a mechanical system problem. LA.A.1.4, LA.A.2.4, LA.C.3.4
 - 26.10 Formulate conclusions based on the analysis of engineered products. MA.B.4.4, MA.E.1.4, MA.E.3.4
- 27.0 DEMONSTRATE AN UNDERSTANDING OF CAREER OPPORTUNITIES AND REQUIREMENTS IN THE FIELD OF ENGINEERING TECHNOLOGY--The student will be able to:
- 27.01 Discuss individual interests related to a career in engineering technology. LA.B.2.4
 - 27.02 Explore career opportunities related to engineering technology. LA.A.1.4, LA.A.2.4, LA.B.2.4
 - 27.03 Explore secondary education opportunities related to engineering technology. LA.A.1.4, LA.A.2.4, LA.B.2.4
 - 27.04 Conduct a job search. LA.A.1.4, LA.A.2.4
 - 27.05 Complete a job application form correctly. LA.B.2.4
 - 27.06 Demonstrate competence in job interview techniques. LA.C.1.4, LA.C.3.4, LA.D.1.4
 - 27.07 Create a professional resume and letter of introduction. LA.A.1.4, LA.A.2.4, LA.B.1.4, LA.B.2.4
 - 27.08 Solicit awards, letters of recommendation and recognition. LA.A.1.4, LA.A.2.4, LA.C.3.4, LA.D.1.4
 - 27.09 Organize work samples in a professional, presentable format. LA.B.2.4, LA.C.3.4, LA.D.1.4

**Florida Department of Education
STUDENT PERFORMANCE STANDARDS**

Course Number: 8600650
Course Title: Engineering Design and Development
Course Credit: 1

COURSE DESCRIPTION: This program provides students with an advanced understanding of the knowledge, human relations, and technological skills found today in technical profession.

- 01.0 DEMONSTRATE AN UNDERSTANDING OF THE CHARACTERISTICS AND SCOPE OF TECHNOLOGY--The student will be able to:
- 01.01 Conduct specific goal-directed research related to inventions and innovations. STL.1.L, LA.A.1.4, LA.A.2.4, LA.B.2.4
 - 01.02 Evaluate current technological developments that are/were driven by profit motive and the market. STL.1.M, SS.D.1.4
- 02.0 DEMONSTRATE AN UNDERSTANDING OF THE CORE CONCEPTS OF TECHNOLOGY--The student will be able to:
- 02.01 Apply systems thinking logic and creativity with appropriate compromises in complex real-life problems. STL.2.W
 - 02.02 Assess technological systems, which are the building blocks of technology and are embedded within larger technological, social, and environmental systems. STL.2.X, LA.D.2.4
 - 02.03 Assess the stability of a technological system and its influence by all of the components in the system, especially those in the feedback loop. STL.2.Y
 - 02.04 Compare resources involving trade-offs between competing values, such as availability, cost, desirability, and waste. STL.2.Z, SS.D.1.4
 - 02.05 Identify the criteria and constraints of a product or system and determine how they affect the final design and development. STL.2.AA, MA.A.5.4, MA.B.1.4, MA.B.3.4, MA.B.4.4, MA.E.3.4, SC.H.1.4
 - 02.06 Propose strategies for optimizing a technological process or methodology of designing or making a product, dependent on criteria and constraints. STL.2.BB
 - 02.07 Discuss new technologies that create new processes. STL.2.CC
 - 02.08 Recommend a quality control process to ensure that a product, service or system meets established criteria. STL.2.DD
 - 02.09 Organize a management system as the process of planning, organizing, and controlling work. STL.2.EE
 - 02.10 Outline complex systems that have many layers of controls and feedback loops to provide information. STL.2.FF
- 03.0 DEMONSTRATE AN UNDERSTANDING OF THE RELATIONSHIPS AMONG TECHNOLOGIES AND THE CONNECTION BETWEEN TECHNOLOGY AND OTHER FIELDS OF STUDY--The student will be able to:
- 03.01 Examine technology transfer occurring when a new user applies an existing innovation developed for one purpose in a different function. STL.3.G, SC.H.3.4

- 03.02 Examine technological innovation resulting when ideas, knowledge, or skills are shared within a technology, among technologies, or across other fields. STL.3.H, SC.H.3.4
- 03.03 Investigate technological progresses that promote the advancement of science and mathematics. STL.3.J, LA.A.1.4, LA.B.1.4, SC.H.3.4
- 04.0 DEMONSTRATE AN UNDERSTANDING OF THE CULTURAL, SOCIAL, ECONOMIC, AND POLITICAL EFFECTS OF TECHNOLOGY--The student will be able to:
- 04.01 Discuss changes caused by the use of technology ranging from gradual to rapid and from subtle to obvious. STL.4.H
- 04.02 Evaluate the use of technology involving weighing the trade-offs between the positive and the negative effects. STL.4.I, LA.B.2.4
- 04.03 Discuss ethical considerations important in the development, selection, and use of technologies. STL.4.J, SC.H.1.4, SS.C.2.4
- 04.04 Debate the cultural, social, economic, and political changes caused by the transfer of a technology from one society to another. STL.4.K, LA.B.2.4, LA.E.1.4, SC.H.3.4
- 05.0 DEMONSTRATE AN UNDERSTANDING OF THE EFFECTS OF TECHNOLOGY ON THE ENVIRONMENT--The student will be able to:
- 05.01 Consider trade-offs of developing technologies to reduce the use of resources. STL.5.H, SC.G.2.4, SS.D.1.4
- 05.02 Compare and contrast the alignment of technological processes with natural processes to maximize performance and reduce negative impacts on the environment. STL.5.J, SC.G.2.4, SS.B.2.4
- 05.03 Assess technologies devised to reduce the negative consequences of other technologies. STL.5.K
- 05.04 Make decisions about the implementation of technologies involving the weighing of trade-offs between predicted positive and negative effects on the environment. STL.5.L, SC.G.2.4, SC.H.3.4
- 06.0 DEMONSTRATE AN UNDERSTANDING OF THE ROLE OF SOCIETY IN THE DEVELOPMENT AND USE OF TECHNOLOGY--The student will be able to:
- 06.01 Consider societal opinions and demands, as well as corporate cultures to use as a basis for deciding whether or not to develop a technology. STL.6.I
- 06.02 Evaluate a number of different factors, such as advertising, the strength of the economy, the goals of a company, and the latest fads as contributors to shaping the design of and demand for various technologies. STL.6.J, LA.D.2.4, SS.A.1.4, SS.D.2.4
- 07.0 DEMONSTRATE AN UNDERSTANDING OF THE INFLUENCE OF TECHNOLOGY ON HISTORY--The student will be able to:
- 07.01 Assess how the evolution of civilization has been directly affected by, and has in turn affected, the development and use of tools and materials. STL.7.H, LA.A.1.4, LA.A.2.4, LA.B.2.4, SC.H.3.4, SS.A.2.4
- 07.02 Discuss the history of technology as a powerful force in reshaping the social, cultural, political, and economic landscape. STL.7.I, LA.D.2.4, SS.A.2.4

- 07.03 Describe the Iron Age as the use of iron and steel as the primary materials for tools. STL.7.K
 - 07.04 Discuss the Industrial Revolution and the development of continuous manufacturing, sophisticated transportation and communication systems, advanced construction practices, and improved education and leisure time. STL.7.N, SS.A.5.4
 - 07.05 Describe the Information Age and its placement of emphasis on the processing and exchange of information. STL.7.O, SS.A.5.4
- 08.0 DEMONSTRATE AN UNDERSTANDING OF THE ATTRIBUTES OF DESIGN--The student will be able to:
- 08.01 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. STL.8.H
 - 08.02 Translate design problems that are seldom presented in a clearly defined form. STL.8.I, LA.D.1.4, LA.D.2.4
 - 08.03 Evaluate a design continually, and improve and revise the idea of the design as needed. STL.8.J, SC.H.1.4
 - 08.04 Analyze competing requirements of a design, such as criteria, constraints, and efficiency. STL.8.K, MA.A.3.4, MA.B.1.4, MA.B.3.4, MA.B.4.4, MA.D.1.4, MA.D.2.4, MA.E.1.4
- 09.0 DEMONSTRATE AN UNDERSTANDING OF ENGINEERING DESIGN--The student will be able to:
- 09.01 Select design principles used to evaluate existing designs, to collect data, and to guide the design process. STL.9.I
 - 09.02 Examine the influence of personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly on the Engineering Design process. STL.9.J, LA.D.1.4, SC.H.1.4
 - 09.03 Construct a prototype or a working model used to test a design concept by making actual observations and necessary adjustments. STL.9.K, MA.B.1.4, SC.H.1.4, SC.H.3.4
 - 09.04 Evaluate factors taken into account in the process of engineering. STL.9.L
- 10.0 DEMONSTRATE AN UNDERSTANDING OF THE ROLE OF TROUBLESHOOTING, RESEARCH AND DEVELOPMENT, INVENTION AND INNOVATION, AND EXPERIMENTATION IN PROBLEM SOLVING--The student will be able to:
- 10.01 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. STL.10.I
 - 10.02 Conduct research needed to solve technological problems. STL.10.J, LA.A.1.4, LA.A.2.4
 - 10.03 Differentiate between technological and non-technological problems, and identify which problems can be solved using technology. STL.10.K, SC.H.1.4
 - 10.04 Utilize a multidisciplinary approach to solving technological problems. STL.10.L, MA.A.1.4, MA.A.3.4, MA.B.1.4, MA.B.3.4, MA.B.4.4, MA.E.1.4, MA.E.3.4, SC.H.1.4, SC.H.3.4

11.0 DEMONSTRATE THE ABILITIES TO APPLY THE DESIGN PROCESS--The student will be able to:

- 11.01 Interpret the design problem to solve and decide whether or not to address it. STL.11.M, SC.H.1.4
- 11.02 Evaluate criteria and constraints and determine how these will affect the design process. STL.11.N, MA.A.3.4, MA.B.1.4, MA.B.3.4, MA.B.4.4, MA.D.1.4, MA.D.2.4, MA.E.1.4, SC.H.1.4, SC.H.3.4
- 11.03 Refine a design by using prototypes and modeling to ensure quality, efficiency, and productivity of the final product. STL.11.O
- 11.04 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. STL.11.P, MA.A.4.4, MA.B.1.4, MA.B.3.4, MA.B.4.4, SC.H.1.4, SC.H.3.4
- 11.05 Produce a product or system using a design process. STL.11.Q
- 11.06 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. STL.11.R, LA.B.2.4, LA.C.3.4, MA.B.4.4, MA.D.2.4, MA.E.1.4, MA.E.2.4, MA.E.3.4, SC.H.1.4, SC.H.3.4

12.0 DEMONSTRATE THE ABILITIES TO USE AND MAINTAIN TECHNOLOGICAL PRODUCTS AND SYSTEMS--The student will be able to:

- 12.01 Document processes and procedures and communicate them to different audiences using appropriate oral and written techniques. STL.12.L, LA.B.1.4, LA.B.2.4, LA.C.3.4
- 12.02 Diagnose a system that is malfunctioning and use tools, materials, machines, and knowledge to repair it. STL.12.M
- 12.03 Troubleshoot, analyze, and maintain systems to ensure safe and proper function and precision. STL.12.N
- 12.04 Operate systems so that they function in the way they were designed. STL.12.O
- 12.05 Use computers and calculators to access, retrieve, organize, process, maintain, interpret, and evaluate data and information in order to communicate. STL.12.P, LA.A.2.4, MA.E.1.4

13.0 DEMONSTRATE THE ABILITIES TO ASSESS THE IMPACT OF PRODUCTS AND SYSTEMS--The student will be able to:

- 13.01 Collect information and evaluate its quality. STL.13.J, LA.A.2.4, SC.H.1.4
- 13.02 Synthesize data, analyze trends, and draw conclusions regarding the effect of technology on the individual, society, and the environment. STL.13.K, LA.A.2.4, SC.G.1.4, SC.G.2.4, SC.H.1.4
- 13.03 Apply assessment techniques, such as trend analysis and experimentation to make decisions about the future development of technology. STL.13.L, LA.A.2.4, MA.E.1.4, MA.E.2.4, MA.E.3.4
- 13.04 Design forecasting techniques to evaluate the results of altering natural systems. STL.13.M, MA.E.3.4, SC.G.2.4

16.0 DEMONSTRATE AN UNDERSTANDING OF AND BE ABLE TO SELECT AND USE ENERGY AND POWER TECHNOLOGIES--The student will be able to:

- 16.01 Discuss how energy cannot be created nor destroyed; however, it can be converted from one form to another. STL.16.J
 - 16.02 Categorize types of energy into major forms: thermal, radiant, electrical, mechanical, chemical, nuclear, and others. STL.16.K
 - 16.03 Classify energy resources as renewable or nonrenewable. STL.16.M
 - 16.04 Construct a power system having a source of energy, a process, and loads. STL.16.N
- 17.0 DEMONSTRATE AN UNDERSTANDING OF AND BE ABLE TO SELECT AND USE INFORMATION AND COMMUNICATION TECHNOLOGIES--The student will be able to:
- 17.01 Discuss information and communication technologies including the inputs, processes, and outputs associated with sending and receiving information. STL.17.L
 - 17.02 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. STL.17.M
 - 17.03 Use information and communication systems to inform, persuade, entertain, control, manage, and educate. STL.17.N
 - 17.04 Identify components of a communications system, including source, encoder, transmitter, receiver, decoder, storage, retrieval, and destination. STL.17.O
 - 17.05 Identify many ways to communicate information, such as graphic and electronic means. STL.17.P
 - 17.06 Communicate technological knowledge and processes using symbols, measurement, conventions, icons, graphic images, and languages that incorporate a variety of visual, auditory, and tactile stimuli. STL.17.Q
- 18.0 DEMONSTRATE AN UNDERSTANDING OF AND BE ABLE TO SELECT AND USE TRANSPORTATION TECHNOLOGIES--The student will be able to:
- 18.01 Analyze the vital role played by transportation in the operation of other technologies, such as manufacturing, construction, communication, health and safety, and agriculture. STL.18.J
 - 18.02 Define intermodalism as the use of different modes of transportation, such as highways, railways, and waterways as part of an interconnected system that can move people and goods easily from one mode to another. STL.18.K
 - 18.03 Discuss how transportation services and methods have led to a population that is regularly on the move. STL.18.L
 - 18.04 Identify processes and innovative techniques involved in the design of intelligent and non-intelligent transportation systems. STL.18.M
- 19.0 DEMONSTRATE AN UNDERSTANDING OF AND BE ABLE TO SELECT AND USE MANUFACTURING TECHNOLOGIES--The student will be able to:
- 19.01 Service products to keep them in good operating condition. STL.19.L
 - 19.02 Classify materials based on their qualities as natural, synthetic, or mixed. STL.19.M
 - 19.03 Classify goods as durable goods designed to operate for a long period of time, or non-durable goods designed to operate for a short period of time. STL.19.N

- 19.04 Identify and classify manufacturing systems into types, such as customized production, batch production, and continuous production. STL.19.0
 - 19.05 Discuss the interchangeability of parts to increase the effectiveness of manufacturing processes. STL.19.P
 - 19.06 Employ marketing techniques involving establishing a product's identity, conducting research on its potential, advertising it, distributing it, and selling it. STL.19.R
- 20.0 DEMONSTRATE AN UNDERSTANDING OF AND BE ABLE TO SELECT AND USE CONSTRUCTION TECHNOLOGIES--The student will be able to:
- 20.01 Define infrastructure as the underlying base or basic framework of a system. STL.20.J
 - 20.02 Identify a variety of processes and procedures used in constructing structures. STL.20.K
 - 20.03 Identify requirements involved in the design of structures. STL.20.L
 - 20.04 Recommend maintenance, alterations, or renovations to improve a structure or alter its intended use. STL.20.M
 - 20.05 Identify prefabricated materials used in some structures. STL.20.N
- 21.0 DEMONSTRATE SAFE AND APPROPRIATE USE OF TOOLS AND MACHINES IN ENGINEERING TECHNOLOGY--The student will be able to:
- 21.01 Select appropriate tools, procedures, and/or equipment.
 - 21.02 Demonstrate the safe usage of appropriate tools, procedures, and operation of equipment.
 - 21.03 Follow laboratory safety rules and procedures.
 - 21.04 Demonstrate good housekeeping at workstation within total laboratory.
 - 21.05 Identify color-coding safety standards.
 - 21.06 Explain fire prevention and safety precautions and practices for extinguishing fires.
 - 21.07 Identify harmful effects/potential dangers of familiar hazardous substances/devices to people and the environment.
- 22.0 DEMONSTRATE THE ABILITY TO PROPERLY IDENTIFY, ORGANIZE, PLAN, AND ALLOCATE RESOURCES--The student will be able to:
- 22.01 Demonstrate the ability to select goal-relevant activities, rank them, allocate time, and prepare and follow schedules.
 - 22.02 Use or prepare budgets, make forecasts, keep records, and make adjustments to meet objectives. MA.B.3.4, MA.E.1.4
 - 22.03 Demonstrate the ability to acquire, store, allocate, and use materials or space efficiently.
 - 22.04 Display knowledge of the efficient use of human resources.
- 23.0 DEMONSTRATE THE FUNCTIONAL CHARACTERISTICS OF THE ENGINEERING DESIGN TEAM--The student will be able to:
- 23.01 Describe work breakdown organization.
 - 23.02 Describe work group organization schemes including functional and hierarchical schemes.
 - 23.03 Describe the function of management in general and project management in particular.

- 23.04 Describe a typical design project team structure.
 - 23.05 Outline a research methodology. LA.B.1.4
 - 23.06 Demonstrate brainstorming techniques. LA.B.1.4
- 24.0 DEMONSTRATE TECHNICAL KNOWLEDGE AND SKILLS IN THE PROCESSES AND SYSTEMS RELATED TO ENGINEERING--The student will be able to:
- 24.01 Assemble, operate, and identify the parts of a fluid system.
SC.C.1.4, SC.C.2.4, SC.H.3.4
 - 24.02 Demonstrate and apply principles of force, work, rate, resistance, energy, power, and force transformers relating to fluid systems. SC.C.1.4, SC.C.2.4
 - 24.03 Assemble, operate, and identify the parts of a thermal system.
SC.B.1.4, SC.B.2.4, SC.H.3.4
 - 24.04 Demonstrate and apply principles of force, work, rate, resistance, energy, power, and force transformers relating to thermal systems. SC.C.1.4, SC.C.2.4
 - 24.05 Assemble, operate, and identify the parts of an electrical system. SC.A.2.4, SC.C.2.4, SC.H.3.4
 - 24.06 Demonstrate and apply principles of force, work, rate, resistance, energy, power, and force transformers relating to electrical systems. SC.A.2.4, SC.C.1.4, SC.C.2.4
 - 24.07 Assemble, operate, and identify the parts of a mechanical system.
SC.C.1.4, SC.C.2.4, SC.H.3.4
 - 24.08 Demonstrate and apply principles of force, work, rate, resistance, energy, power, and force transformers relating to mechanical systems. SC.C.1.4, SC.C.2.4
- 25.0 DEMONSTRATE TECHNICAL KNOWLEDGE AND SKILLS IN THE DESIGNING, ENGINEERING, AND ANALYSIS OF CONSTRUCTED WORKS--The student will be able to:
- 25.01 Define terminology associated with engineering products, processes, and systems.
 - 25.02 Define and describe the experimental method as it is applied to design.
 - 25.03 Describe simulation.
 - 25.04 Prepare a model of a design solution to an engineering problem.
SC.H.3.4
 - 25.05 Prepare a graphical solution to an engineering problem. MA.D.2.4
 - 25.06 Prepare a mathematical solution to an engineering problem (using either a calculator or computer). MA.D.2.4
 - 25.07 Present a technical report on an engineering design problem, concept or issue. LA.C.3.4, LA.D.1.4
- 26.0 PERFORM ADVANCED STUDY AND TECHNICAL SKILLS RELATED TO ENGINEERING TECHNOLOGY--The student will be able to:
- 26.01 Identify an engineering problem or product for improvement using engineering design methodology.
 - 26.02 Develop a written plan of work for the engineering team to carry out the project. LA.B.1.4, LA.B.2.4
 - 26.03 Show evidence of technical research in support of the project.
LA.A.1.4, LA.A.2.4
 - 26.04 Perform skills related to the engineering project.
 - 26.05 Complete the project as planned.

- 26.06 Demonstrate the engineering design solution to a fluid system problem. LA.C.3.4
 - 26.07 Demonstrate the engineering design solution to an electrical system problem. LA.C.3.4
 - 26.08 Demonstrate the engineering design solution to a thermal system problem. LA.C.3.4
 - 26.09 Demonstrate and present the engineering design solution to a mechanical system problem. LA.A.1.4, LA.A.2.4, LA.C.3.4
 - 26.10 Formulate conclusions based on the analysis of engineered products. MA.B.4.4, MA.E.1.4, MA.E.3.4
- 27.0 DEMONSTRATE AN UNDERSTANDING OF CAREER OPPORTUNITIES AND REQUIREMENTS IN THE FIELD OF ENGINEERING TECHNOLOGY--The student will be able to:
- 27.01 Discuss individual interests related to a career in engineering technology. LA.B.2.4
 - 27.02 Explore career opportunities related to engineering technology. LA.A.1.4, LA.A.2.4, LA.B.2.4
 - 27.03 Explore secondary education opportunities related to engineering technology. LA.A.1.4, LA.A.2.4, LA.B.2.4
 - 27.04 Conduct a job search. LA.A.1.4, LA.A.2.4
 - 27.05 Complete a job application form correctly. LA.B.2.4
 - 27.06 Demonstrate competence in job interview techniques. LA.C.1.4, LA.C.3.4, LA.D.1.4
 - 27.07 Create a professional resume and letter of introduction. LA.A.1.4, LA.A.2.4, LA.B.1.4, LA.B.2.4
 - 27.08 Solicit awards, letters of recommendation and recognition. LA.A.1.4, LA.A.2.4, LA.C.3.4, LA.D.1.4
 - 27.09 Organize work samples in a professional, presentable format. LA.B.2.4, LA.C.3.4, LA.D.1.4