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CTAE Basics	**STEM-FET-1** The following standard is included in all CTAE courses adopted for the Career Cluster/Pathways. Teachers should incorporate the elements of this standard into lesson plans during the course. The topics listed for each element of the standard may be addressed in differentiated instruction matching the content of each course. These elements may also be addressed with specific lessons from a variety of resources. This content is not to be treated as a unit or separate body of knowledge but rather integrated into class activities as applications of the concept. **Standard:** **Demonstrate employability skills required by business and industry.** **The following elements should be integrated throughout the content of this course.**	This standard is integrated into each lesson for 18 weeks.
CTSO TSA	**STEM-FET-10** Students explore how related career and technology student organizations are integral parts of career and technology education courses. Students will develop leadership, interpersonal, and problem-solving skills through participation in co-curricular activities associated with the Technology Student Association.	TSA is combined with each class.
Unit 1: What is Engineering	**STEM-FET-2** Develop an understanding of engineering and technology and describe the principal fields of engineering specializations (ex. aeronautical, automotive, chemical, civil, industrial, mechanical, computer software, electrical, and biomedical) and identify associated career tracks. **2.1** Explain a contemporary definition of engineering. **2.2** Identify education requirements for engineering occupations and locations where programs of study are available. **2.3** Match engineering job titles with qualifications and responsibilities. **2.4** Participate in activities related to career interests. **2.5** Explain how each engineering discipline will relate to a green environment and sustainability	**3 weeks**

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Unit 2: Safety	**STEM-FET-4** Demonstrate and follow safety, health, and environmental standards related to the Science, Technology, Engineering, and Math (STEM) workplaces. **4.1** Implement workplace and product safety standards such as OSHA, EPA, ISO, GMP, and UL. (STEM-ST3). **4.2** Accurately interpret safety signs, symbols, and labels (Hazardous Communications). **4.3** Demonstrate and incorporate safe laboratory procedures in lab, shop, and field environments. **4.4** Explain how the incorporation or lack of safety practices impact the economy and costs of safety in business and industry. **4.5** Identify, select, and use appropriate Personal Protective Equipment (PPE), follow work area organization procedures and follow Standard Operating Procedures (SOP) when performing work.	**1 week** (also integrated into daily work in the lab)
Unit 3: Tool and Machine Maintenance and Care	**STEM-FET-5** Identify criteria of usage, care, and maintenance for tools and machines. **5.1** Identify, select, and use appropriate tools and machines for specific tasks. **5.2** Demonstrate safe use of tools and machines. **5.3** Use precision tools and instruments to measure and convert units. **5.4** Utilize appropriate computer hardware and software to compose, analyze and synthesize data to document the design process. **5.5** Apply proper maintenance techniques for tools, machines, and hardware.	**1 week** (also integrated into daily work in the lab)
Unit 4: Engineering Design Process	**STEM-FET-6** Apply fundamental principles of the engineering design process. **6.1** Understand and apply the engineering design process through project based learning activities. **6.2** Conduct technical research to develop possible solutions to a stated engineering problem. **6.3** Refine a design by using technical sketches, prototypes and modeling to ensure quality, efficiency, and productivity of the final product. **6.4** Evaluate the design solution using conceptual, physical, and mathematical models at various intervals of the design process (optimization and iterations) in order to check for proper design and note areas where improvements are needed. **6.5** Apply engineering economics and optimal design techniques to a design solution. **6.6** Record and organize observations and test data during design evaluation. **6.7** Finalize solutions and communicate observation, processes, and results of the entire	**3 weeks**

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	design process, using verbal, graphic, quantitative, qualitative, virtual, and physical means.	
Unit 5: Math and Science	**STEM-FET-8** Students design a solution to an engineering problem applying math and science principles. **8.1** Apply science and mathematics concepts and principles to resolve plans, projects, processes, issues, or problems through methods of inquiry. **8.2** Use the protocols in science and mathematics to integrate solutions related to technical or engineering activities using the content and concepts related to the situation or problems. **8.3** Explain the role of modeling and/or simulation in science and engineering. **8.4** Communicate and collaborate with others on inquiry or resolution of issues/problems in the global community. **8.5** Defend one's solution based on quality collection of facts and data supporting plans, processes, and/or projects and communicate the solution both orally and written.	**3 weeks**
Unit 6: Data analysis	**STEM-FET-7** Use appropriate technology to collect, record, manipulate, analyze, and report data. **7.1** Demonstrate the ability to recognize cause and effect when faced with projects or issues. **7.2** Recognize measurable attributes in units, objects, systems, and processes in assigned activities. **7.3** Organize data and the consequences of the problems or issues, and research the material placing it in manageable formats. **7.4** Attempt to predict the outcomes based on data collected in a project or experiment. **7.5** Defend one's position based on quality collection of facts and data supporting plans, processes, and/or projects. **7.6** Draw a conclusion when confronted with data or observations that focus on the observed plans, processes, or projects at hand. **7.7** Analyze change as a result of data differences and changing environmental values. **7.8** Use qualitative and quantitative skills to conduct a simple scientific inquiry and economic analysis; use the data to draw a conclusion based on the analysis. **7.9** Recognize the value of the reiterative process to improve date and to improve the design process.	**3 weeks**
Unit 7:	**STEM-FET-3**	**3 weeks** (Many of

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Evolution of Engineering	Identify the history of technology and engineering and its impact on society in the past, present, and future. **3.1** Describe the history and development of engineering. **3.2** Describe the social, economic, and environmental impacts of a technological process, product, or system. **3.3** Explain the influence of technology on history and the shaping of contemporary issues. **3.4** Describe the relationship between the STEM cluster and society. **3.5** Evaluate the impact of science and society based on products and processes used in the real world for technological development. **3.6** Understand STEM knowledge and skills to analyze and suggest solutions to human societal problems. **3.7** Apply STEM knowledge and skills through hands-on research and lab experiments that are focused upon recreating the inventions and social solutions that were realized in the past, present, and possible future. **3.8** Identify key people who have influenced technological change. **3.9** Describe the impact of governmental and political systems on technological innovations. **3.10** Demonstrate ethical and professional engineering behavior in the development and use of technology.	these points are also included in the projects throughout the course.)
Unit 8: Where are they?	**STEM-FET-9** Demonstrate the application of STEM in the real world. **9.1** Summarize and differentiate the uses of engineering and various technologies for STEM fields such as Aerospace, Automotive, Medical, Biotechnology, Energy and Power, Information and Communication, Automation and Robotics, Transportation, Manufacturing, and Construction.	**1 week**