

Seymour Public Schools Curriculum

Alternative Energy Engineering 3

Unit 1

Alternative Energy Engineering Careers, Goals Expectations

Narrative.....In the world of alternative energy there is a high demand for competent, skilled and driven engineers. The entire alternative energy industry is driven and ran by these engineers. One of the fastest growing job markets for engineers is in the energy trades. Oil companies are recognizing the facts that they need new ways to make money through energy sources. These new crop of engineers they are hiring are focused on the alternative energy sector of the market. There are so many different types of alternative energy technologies being developed that the future engineers of the world are able to pick and choose their specialties to focus their energy on. The students will be able to explore the different types of engineering jobs that are available. The students will be exploring the expectations of these engineers and goals to meet those expectations.

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| Grade: 10-11 | <p style="text-align: center;">Subject: Technology Education- Alternative Energy Engineering 3 Current Engineering Jobs Future Engineering Jobs Expectations of Engineers</p> |
| CTE Standard | <p><i>Pre-Engineering Technology Standards</i></p> <p><i>A. Career Awareness: Identify and describe various careers in the engineering field including educational requirements and ethical expectations.</i></p> <p><i>READING STANDARDS</i> <i>6) MAKE CONNECTIONS BETWEEN THE TEXT AND OUTSIDE EXPERIENCES AND KNOWLEDGE</i></p> <p><i>8) USE EVIDENCE FROM THE TEXT TO DRAW AND/OR SUPPORT A CONCLUSION</i></p> |
| Enduring Understanding | <ul style="list-style-type: none"> ● Alternative energy technologies have many opportunities for engineering careers ● Engineers are an important factor in today's energy market. ● Engineers must work under strict guidelines and regulations. ● Engineers work as a team to solve multiple problems in today's work force. ● Problem solving skills is important to development as an engineer. |
| Essential Questions | <ul style="list-style-type: none"> ● What can an individual do to prepare for the type of engineering job they desire? ● Which engineering career is the best for my interests? ● What types of alternative energy engineering careers are available? |

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| | <ul style="list-style-type: none"> • How do the different types of engineering jobs differ from one another? • What are the expectations of an engineer? |
| <p>Content Standard:</p> | <p><i>Pre-Engineering Technology Standards</i></p> <p><i>A. Career Awareness: Identify and describe various careers in the engineering field including educational requirements and ethical expectations.</i></p> <ol style="list-style-type: none"> 1. Describe major engineering fields. 2. Identify functions of an engineer. 3. Identify educational requirements for an engineer. 4. Describe ethics related to engineering situations (e.g., environmental, sustainable engineering, medical, and corrupt practices.) <p>READING STANDARDS</p> <p>6) MAKE CONNECTIONS BETWEEN THE TEXT AND OUTSIDE EXPERIENCES AND KNOWLEDGE</p> <ul style="list-style-type: none"> • Students recognize and appreciate that contemporary and classical literature has shaped human thought • Students interpret, analyze and evaluate text in order to extend understanding and appreciation • Students communicate with others to create interpretations of written, oral and visual texts • Students select and apply strategies to facilitate word recognition and develop vocabulary in order to comprehend text • Students use appropriate strategies before, during and after reading in order to construct meaning <p>8) USE EVIDENCE FROM THE TEXT TO DRAW AND/OR SUPPORT A</p> |

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| | <p>CONCLUSION</p> <ul style="list-style-type: none">• Students interpret, analyze and evaluate text in order to extend understanding and appreciation• Students communicate with others to create interpretations of written, oral and visual texts• Students use appropriate strategies before, during and after reading in order to construct meaning |
| <p>Performance Expectations (Student outcomes)</p> | <p>Students will be able to use vocabulary related directly to engineering:</p> <ul style="list-style-type: none">● Analysis● Systems● Communications● Design● Constraints● Ethics● Environmental Impact <p>Students will be able to discuss the differences in the types of the following engineering jobs:</p> <ul style="list-style-type: none">● Mechanical● Thermal● Electrical● Fluid● Civil● Environmental● Medical● Chemical |

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| Strategies/Modes | Materials/Resources (examples) | Assessments (examples) |
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| <ul style="list-style-type: none"> ● Class discussion to assess prior knowledge engineers and their jobs. ● Reading Assignments- news article hand outs ● | <ul style="list-style-type: none"> ● Supplementary materials- news articles, hand outs. | <p>Design Brief - Career selection and educational demands</p> <p>Student Presentation</p> <p>Unit Quiz</p> |

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Unit 2

Safe/Responsible and Ethical Engineering Lab use

Narrative.....Safety, responsibility and proper work ethics in an engineering lab are of upmost concern when it comes to working in the lab. Engineers work very closely with the manufacturing of the product and are always safety conscious. The importance of knowing, understanding and demonstrating safe practices in reinforced throughout the lessons. The nature and characteristics of engineering are discussed so students will be able to select appropriate materials for a particular job. The unit is also designed to allow students who have never used any equipment relating to metal fabrication to be practiced and mastered throughout the year. This will prepare students for workforce, trades and engineering jobs.

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| Grade: 11-12 | <p style="text-align: center;">Subject: Technology Education- Alternative Energy Engineering 3 Safety Techniques</p> |
| CTE Standard | <p><i>Pre-Engineering Technology Standards</i> <i>C. Safe/Responsible and Ethical Engineering Lab Use: Describe the various types of laboratory equipment and materials used in engineering addressing the importance of quality control and safety.</i></p> <p>READING STANDARDS 6) MAKE CONNECTIONS BETWEEN THE TEXT AND OUTSIDE EXPERIENCES AND KNOWLEDGE</p> <p>8) USE EVIDENCE FROM THE TEXT TO DRAW AND/OR SUPPORT A CONCLUSION</p> |
| Enduring Understanding | <ul style="list-style-type: none"> ➤ Ideas require action to become a reality. ➤ Effective problem solving works to understand the problem before attempting a solution. ➤ Decisions about what to use and how to use it, affects the end result and process to arrive at an end result. ➤ Development practices and different materials usage require different processes and safety considerations. . ➤ Quality management is critical to prototype development and success. |
| Essential Questions | <ul style="list-style-type: none"> ➤ What is the problem and what is needed to solve it? ➤ How are human products created? ➤ What is the correct process or processes to complete the job? ➤ What role does communication play in product development and in world development? ➤ How is home and work place safety regulated? |

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| Content Standard: | <p><i>Pre-Engineering Technology Standards</i></p> <p><i>C. Safe/Responsible and Ethical Engineering Lab Use: Describe the various types of laboratory equipment and materials used in engineering addressing the importance of quality control and safety.</i></p> <p>12. Explain and use pre-engineering laboratory equipment and materials.</p> <p>13. Explain quality control.</p> <p>14. Measure with precision measurement tools and instruments.</p> <p>15. Describe and demonstrate the components of personal and group laboratory safety.</p> <p>16. Describe and use safety laboratory equipment</p> <p>READING STANDARDS</p> <p>6) MAKE CONNECTIONS BETWEEN THE TEXT AND OUTSIDE EXPERIENCES AND KNOWLEDGE</p> <ul style="list-style-type: none">• Students recognize and appreciate that contemporary and classical literature has shaped human thought• Students interpret, analyze and evaluate text in order to extend understanding and appreciation• Students communicate with others to create interpretations of written, oral and visual texts• Students select and apply strategies to facilitate word recognition and develop vocabulary in order to comprehend text• Students use appropriate strategies before, during and after reading in order to construct meaning <p>8) USE EVIDENCE FROM THE TEXT TO DRAW AND/OR SUPPORT A CONCLUSION</p> |
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| | <ul style="list-style-type: none"> • Students interpret, analyze and evaluate text in order to extend understanding and appreciation • Students communicate with others to create interpretations of written, oral and visual texts • Students use appropriate strategies before, during and after reading in order to construct meaning |
| <p>Performance Expectations (Student outcomes)</p> | <ul style="list-style-type: none"> ➤ Each student will prove to be efficient on machine safety and usage. <ul style="list-style-type: none"> ❖ Machine safety practices ❖ Machine Safe Usage; Mig Welder, Tig Welder, Plasma Torch, Angle Grinder, Bench Grinder, Band saw, Hole saws, drill press, belt sander, hand sander, tubing bender, tubing notcher, milling machine. ➤ Each student will be required to perform simple manufacturing processes in the development of the prototype. <ul style="list-style-type: none"> ❖ Assembly line practices and machine usage. ➤ Each student will determine the appropriate raw materials to be used in the prototype development. <ul style="list-style-type: none"> ❖ Understand and Identify raw material processes. ❖ Determine the best possible material to be used for the process. ➤ Each student will perform assembly techniques basic to construction practices in the development of the prototype. <ul style="list-style-type: none"> ❖ Hands on assembly practices ❖ Portable Hand Tools Safe Usage ➤ Each Student will perform quality control checks on each part of the prototype in development. <ul style="list-style-type: none"> ❖ Basic measurement techniques |

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| | ❖ Use of measuring tools. | |
| <p>Strategies/Modes</p> <ul style="list-style-type: none"> ● Class discussion ● Lab activity- Tool usage ● Reading Assignments- Worksheet hand outs. ● | <p>Materials/Resources (examples)</p> <ul style="list-style-type: none"> ● Supplementary materials. ● Tools- Mig welder <ul style="list-style-type: none"> Tig Welder Plasma Torch Milling Machine Angle Grinder Drill Press Belt Sander Tubing Bender Tubing Notcher | <p>Assessments (examples)</p> <p>Reviewing, referencing and applying safety procedures identified in the SHS Technology Safety Manual.</p> <p>Work and dress safely and maintain appropriate lab behavior.</p> <p>Pass all safety quizzes and tests.</p> <p>Students will express the key information in this section both in verbal and written form.</p> <p>Students will work with safety as the key to the daily effort.</p> |

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Unit 3

Research, Planning and Goal Setting

Narrative.....In engineering one of the most important steps is the research, planning and goal setting. To be a good engineering you must be able to properly research past designs, current designs and analyze the designs you have found to take different aspects of them into account while designing your own product. Students will learn the proper techniques of researching and analyzing information to make informative smart design decisions which will allow for proper planning. The planning aspect of a design is critical, every detail needs to be thought of and accounted for before moving forward. The students will properly learn how to set goals in order to complete a task. Students will set up goals for the project which allow the students to keep track of the progress over the course of the project build.

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| Grade: 10-11 | Subject: Technology Education- Alternative Energy Engineering 3 |
| CTE Standard | <p><i>Pre-Engineering Technology Standards</i> <i>B. Design Process: Describe the design process including identifying the problem, determining constraints and limitations, analyzing potential solutions as well as the creation of a prototype for testing.</i></p> <p>READING STANDARDS 6) MAKE CONNECTIONS BETWEEN THE TEXT AND OUTSIDE EXPERIENCES AND KNOWLEDGE</p> <p>8) USE EVIDENCE FROM THE TEXT TO DRAW AND/OR SUPPORT A CONCLUSION</p> |
| Enduring Understanding | <ul style="list-style-type: none"> ● Different materials require different processes and safety considerations. ● Effective problem solvers work to understand the problem before attempting a solution. ● Decisions about what to use and how to use it, affects the end result. ● Research develops knowledge, which instills invention and enhances innovation. ● Intellectual properties are protected by legal and ethical principles. ● Land, fluid, gas and space environments bring challenges to technological practices. ● Attention to details can make ordinary work extraordinary. ● Answers to critical questions narrow the problem. ● Research and Development is a complex process that has constraints ● An impossible problem can be made possible by applying what you already know. |

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| Essential Questions | <ul style="list-style-type: none">● What's the right process for the right job?● Why is energy conversion and control critical to society?● What does quality work look like?● How are products created?● What's the problem?● How do I know?● What am I doing to solve it?● How do individual's actions affect overall product quality? |
| Content Standard: | <p><i>Pre-Engineering Technology Standards</i> <i>B. Design Process: Describe the design process including identifying the problem, determining constraints and limitations, analyzing potential solutions as well as the creation of a prototype for testing.</i></p> <ol style="list-style-type: none">5. Identify principles of a problem.6. Describe the process for researching known, relevant information, constraints and limitations.7. Analyze and research between alternate solutions.8. Develop details of a solution.9. Build a prototype from plans.10. Test a prototype. |

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11. Describe the steps of the design process (e.g, create, evaluate, synthesis, final solution, findings, and present.)

READING STANDARDS

6) MAKE CONNECTIONS BETWEEN THE TEXT AND OUTSIDE EXPERIENCES AND KNOWLEDGE

- Students recognize and appreciate that contemporary and classical literature has shaped human thought
- Students interpret, analyze and evaluate text in order to extend understanding and appreciation
- Students communicate with others to create interpretations of written, oral and visual texts
- Students select and apply strategies to facilitate word recognition and develop vocabulary in order to comprehend text
- Students use appropriate strategies before, during and after reading in order to construct meaning

8) USE EVIDENCE FROM THE TEXT TO DRAW AND/OR SUPPORT A CONCLUSION

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| <p>Performance Expectations (Student outcomes)</p> | <ul style="list-style-type: none"> ● Generate a defense of their exploration proposal. ● Interact with team members to build a coalition to accomplish a plan with appropriate benchmarks. ● Employ electronic and graphic research techniques to research their topics. ● Plan the steps of developing a product from initial idea to final production. ● Demonstrate the ability to communicate an idea through graphic and verbal processes. ● Explain why the engineering process is open ended. ● Perform a focused Internet search on a particular topic and generate a summary of results. ● Research a product and create a presentation that covers its historical development through its present day operation and then predict how this product will change in the future. ● Identify at least 3 development suggestions for team acceptance. | | |
| <p>Strategies/Modes</p> <ul style="list-style-type: none"> ● Class discussion ● Lab activity-research, presentations ● Collaboration with students ● Team work ● Reading Assignments- | <p>Materials/Resources (examples)</p> <ul style="list-style-type: none"> ● Textbook- ● Supplementary materials. ● Computer Labs | <p>Assessments (examples)</p> <p>Participation in class discussions. Evidence of research ability through written and verbal presentations Research presentation for a products' past, present and projected future development processes. Evidence of a T chart identification process. Completion of design briefs Unit Quiz</p> | |

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Unit 4

Material Selection and Analysis

Narrative.....In the world of engineering the biggest issue that engineers deal with are the materials of the products they are designing and their requirements. Students will be able to understand the properties of materials and their correct uses. Engineers have to decide which materials will work best for their products needs and requirements through the analysis of costs, weights, strengths etc. Students will be able to look at the strengths and weakness of each type of material and the requirements that each part of our product will have to withstand. Students will use the data and research they collect on each material to do proper analysis of its strengths and weaknesses to decide which materials to choose for their final design of their product.

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| Grade: 10-11 | Subject: Technology Education- Alternative Energy Engineering 3 |
| CTE Standard | <p><i>Pre-Engineering Technology Standards</i> <i>D. Materials: Describe the various materials used in engineering including the process for selecting the appropriate materials based on usage.</i></p> <p>READING STANDARDS 6) MAKE CONNECTIONS BETWEEN THE TEXT AND OUTSIDE EXPERIENCES AND KNOWLEDGE</p> <p>8) USE EVIDENCE FROM THE TEXT TO DRAW AND/OR SUPPORT A CONCLUSION</p> <p>MATHEMATICS STANDARDS 1) EXTEND THE UNDERSTANDING OF NUMBER TO INCLUDE INTEGERS, RATIONAL NUMBERS AND REAL NUMBERS</p> <p>2) INTERPRET AND REPRESENT LARGE SETS OF NUMBERS WITH THE AID OF TECHNOLOGIES</p> <p>4) DEVELOP AND EVALUATE MATHEMATICAL ARGUMENTS USING REASONING AND PROOF</p> |
| Enduring Understanding | <ul style="list-style-type: none"> ● Different materials require different processes and safety considerations. ● Practice makes permanence; make sure your building good habits. ● Technological understanding requires learning and doing. ● Decisions about what to use and how to use it, affects the end result. ● Trial and Error is a form of innovation ● Research develops knowledge, which instills invention and enhances innovation. |

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| | <ul style="list-style-type: none"> ● Technology is ever changing. ● New and emerging technologies influence educational needs. ● Attention to details can make ordinary work extraordinary. ● Answers to critical questions narrow the problem. |
| Essential Questions | <ul style="list-style-type: none"> ● How are products created? ● What opportunities and challenges will the future provide? ● How does what I learn today connect to what I learned yesterday, and what I will learn in the future? ● How does Business and Industry function? ● What is important (critical) in successfully reaching your goal? ● How do individuals actions affect overall product quality? |
| Content Standard: | <p style="text-align: center;"><i>Pre-Engineering Technology Standards</i></p> <p><i>D. Materials: Describe the various materials used in engineering including the process for selecting the appropriate materials based on usage.</i></p> <p style="padding-left: 40px;">17. Describe the properties of steel, concrete, wood and plastic.</p> <p style="padding-left: 40px;">18. Explain the process used for select the correct materials for specific functions.</p> <p style="padding-left: 40px;">19. Test materials for specific characteristics</p> <p>READING STANDARDS</p> <p>6) MAKE CONNECTIONS BETWEEN THE TEXT AND OUTSIDE EXPERIENCES AND KNOWLEDGE</p> <ul style="list-style-type: none"> • Students recognize and appreciate that contemporary and classical literature has shaped human thought • Students interpret, analyze and evaluate text in order to extend understanding and appreciation |

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- Students communicate with others to create interpretations of written, oral and visual texts
- Students select and apply strategies to facilitate word recognition and develop vocabulary in order to comprehend text
- Students use appropriate strategies before, during and after reading in order to construct meaning

8) USE EVIDENCE FROM THE TEXT TO DRAW AND/OR SUPPORT A CONCLUSION

- Students interpret, analyze and evaluate text in order to extend understanding and appreciation
- Students communicate with others to create interpretations of written, oral and visual texts
- Students use appropriate strategies before, during and after reading in order to construct meaning

MATHEMATICS STANDARDS

1) EXTEND THE UNDERSTANDING OF NUMBER TO INCLUDE INTEGERS, RATIONAL NUMBERS AND REAL NUMBERS

- Compare, locate, label and order real numbers on number lines, scales, coordinate grids and measurement tools
- Select and use an appropriate form of number (integer, fraction, decimal, ratio, percent, exponential, scientific notation, irrational) to solve practical problems involving order, magnitude, measures, labels, locations and scales.

2) INTERPRET AND REPRESENT LARGE SETS OF NUMBERS WITH THE AID OF TECHNOLOGIES

- Use technological tools such as spreadsheets, probes, computer algebra systems and graphing utilities to organize and analyze large amounts of numerical information.

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| | <p>4) DEVELOP AND EVALUATE MATHEMATICAL ARGUMENTS USING REASONING AND PROOF</p> <ul style="list-style-type: none"> • Recognize the validity of an argument • Create logical arguments to solve problems and determine geometric relationships |
| <p>Performance Expectations (Student outcomes)</p> | <p>Identify the structural requirements for the project. Identify the forces that act upon the various systems. Research material that can meet the needs of the project and identify costs and processes necessary for material manipulation. Identify areas within the structure that will require testing for strength and structural integrity Develop appropriate testing devices and analysis charts for components. Create a testing device and perform a test and analysis data to specifications for success. Create mock-ups for testing. Project the effects that forces will have on a given design. Communicate to the team concerns regarding material selection or fabrication. Calculate a Bill of Material for all necessary material for the system in question. Construct a timeline for your solution including appropriate benchmarks and quality control processes being required. Be accurate with all dimensions during the ordering process and construction process. Project the manufacturing flow chart that identifies the order of processing necessary to conclude the task. Create a cost analysis projection for a product. Apply Concurrent Engineering processes when necessary.</p> |

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| Strategies/Modes | Materials/Resources (examples) | Assessments (examples) |
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| <ul style="list-style-type: none">• Class discussion• Lab activity-• Reading Assignments- Textbook- | <ul style="list-style-type: none">• Textbook-• Supplementary materials. | Participation in class discussions. Evidence of appropriate research ability. Research material, make appropriate testing devices, and make a formal presentation to the team. Completion of design briefs. |

Alternative Energy Engineering 3

Unit 5

Fabrication- Material Processing

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Narrative.....In today's world, engineers are dealing with different types of materials and techniques to process them. There are a variety of techniques to do the same task in which each has their own benefit and downfall to them. It is very important that students understand the proper techniques to complete a fabrication challenge to meet the goals of the end product they are creating. Students will become familiar with a variety of metal fabrications processes ranging from mig welding, tig welding, plasma cutting, milling and lathe work. All of these skills will benefit them not only in the pre- engineering class, but will put them ahead of the curve when entering the trades schools, workforce or college.

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| Grade: 10-11 | Subject: Technology Education- Alternative Energy Engineering 3 |
| CTE Standard | <p><i>Pre-Engineering Technology Standards</i></p> <p><i>C. Safe\Responsible and Ethical Engineering Lab Use: Describe the various types of laboratory equipment and materials used in engineering addressing the importance of quality control and safety</i></p> <p><i>F. Technology: Identify and demonstrate the use of various software programs used in the engineering field.</i></p> <p>READING STANDARDS</p> <p>6) MAKE CONNECTIONS BETWEEN THE TEXT AND OUTSIDE EXPERIENCES AND KNOWLEDGE</p> <p>8) USE EVIDENCE FROM THE TEXT TO DRAW AND/OR SUPPORT A CONCLUSION</p> |
| Enduring Understanding | <ul style="list-style-type: none"> ● Products are a result of human inputs, processes and feedback. ● Different materials require different processes and safety considerations. ● Safety habits are learned behaviors. ● Practice makes permanence; make sure your building good habits. ● Effective problem solvers work to understand the problem before attempting a solution. ● An impossible problem can be made possible by applying what you already know. ● Technological understanding requires learning and doing. ● Decisions about what to use and how to use it, affects the end result. ● Trial and Error is a form of innovation. ● Energy is critical to human development. ● New and emerging technologies influence educational needs. ● Attention to details can make ordinary work extraordinary. |

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| | <ul style="list-style-type: none"> ● Answers to critical questions narrow the problem. ● Think before performing. ● Team success depends on communication and collaboration. |
| Essential Questions | <ul style="list-style-type: none"> ● What’s the right process for the right job? ● What does quality work look like? ● What role does communication play in our world? ● What makes your work yours? ● How are products created? ● How does what I learn today connect to what I learned yesterday, and what I will learn in the future? ● What’s the problem? How do I know? What am I doing to solve it? ● What is important (critical) in successfully reaching your goal? ● How do injuries and technologically caused illnesses affect ones life? ● What role does communication play in efficiency? ● How do individual’s actions affect overall product quality? |
| Content Standard: | <p><i>Pre-Engineering Technology Standards</i> <i>C. Safe\Responsible and Ethical Engineering Lab Use: Describe the various types of laboratory equipment and materials used in engineering addressing the importance of quality control and safety.</i></p> <p>12. Explain and use pre-engineering laboratory equipment and materials.</p> <p>13. Explain quality control.</p> <p>14. Measure with precision measurement tools and instruments.</p> <p>15. Describe and demonstrate the components of personal and group laboratory safety.</p> |

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16. Describe and use safety laboratory equipment.

F. Technology: Identify and demonstrate the use of various software programs used in the engineering field.

22. Identify available resources for researching problem solutions.

23. Use word processing software to develop reports.

24. Use presentation software to develop oral presentation of findings.

25. Describe and demonstrate the process for using CAD in a design solution.

26. Use spreadsheet software to develop tables, graphs and charts and track data

READING STANDARDS

6) MAKE CONNECTIONS BETWEEN THE TEXT AND OUTSIDE EXPERIENCES AND KNOWLEDGE

- Students recognize and appreciate that contemporary and classical literature has shaped human thought
- Students interpret, analyze and evaluate text in order to extend understanding and appreciation
- Students communicate with others to create interpretations of written, oral and visual texts
- Students select and apply strategies to facilitate word recognition and develop vocabulary in order to comprehend text
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8) USE EVIDENCE FROM THE TEXT TO DRAW AND/OR SUPPORT A CONCLUSION

- Students interpret, analyze and evaluate text in order to extend understanding and appreciation
- Students communicate with others to create interpretations of written, oral and visual texts
- Students use appropriate strategies before, during and after reading in order to construct meaning

MATHEMATICS STANDARDS

1) EXTEND THE UNDERSTANDING OF NUMBER TO INCLUDE INTEGERS, RATIONAL NUMBERS AND REAL NUMBERS

- Compare, locate, label and order real numbers on number lines, scales, coordinate grids and measurement tools
- Select and use an appropriate form of number (integer, fraction, decimal, ratio, percent, exponential, scientific notation, irrational) to solve practical problems involving order, magnitude, measures, labels, locations and scales.

2) INTERPRET AND REPRESENT LARGE SETS OF NUMBERS WITH THE AID OF TECHNOLOGIES

- Use technological tools such as spreadsheets, probes, computer algebra systems and graphing utilities to organize and analyze large amounts of numerical information.

4) DEVELOP AND EVALUATE MATHEMATICAL ARGUMENTS USING REASONING AND PROOF

- Recognize the validity of an argument
- Create logical arguments to solve problems and determine geometric relationships

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| Performance Expectations (Student outcomes) | <p>Students will be able to apply techniques associated with metal fabrication including: Aluminum, steel, etc. Applications – welding, plasma cutting, torching Safety issues associated with these processes.</p> <p>Students will be able to use various technologies within the manufacturing areas including: Measurements systems Sheet metal techniques Welding techniques Chip tooth/shearing processes CNC/CADD processes</p> <p>Students will be able to read from a detail plan and fabricate to correct tolerances a finished product. Students will be able to maintain a clean and safe environment. Students will perform tasks in a safe manner with appropriate safety attire. Students will be able to work as a team and complete tasks as necessary and to quality standards. Students will be able to communicate a concept idea using communication techniques successfully. Students will maintain equipment to LAB standards and report issues to staff that may create safety concerns. Students will store materials in a safe and appropriate manner. Students will be able to develop jigs/fixtures, holding techniques, prototypes and quality control processes.</p> |
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| Strategies/Modes | Materials/Resources (examples) | Assessments (examples) |
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| <ul style="list-style-type: none"> ● Class discussion ● Lab activity ● Reading Assignments- Textbook- | <ul style="list-style-type: none"> ● Textbook ● Supplementary materials. | <p>Operation of technological processes safely and to appropriate tolerances</p> <p>Reflective reviews that provide students the opportunity to demonstrate their understanding of techniques and processes undertaken or observed.</p> <p>Summative</p> <p style="padding-left: 20px;">Performance: Daily observations</p> <p style="padding-left: 20px;">Other: Individual products produced</p> <p>Formative</p> <p style="padding-left: 20px;">Performance: reflective review paper</p> <p>Self: Self reflection and instructor conversations with individual students</p> |

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Unit 6

Reflection and System Analysis

Narrative..... For any engineer, reflecting upon their work is essential for the improvement of their product. This self reflection is very important for not only engineers but students in a classroom. Students will learn the techniques of reviewing and analyzing a systems data to determine areas of strength and weakness within the system. Students will then take that information and use the design brief process continue to improve upon their designs and improvements.

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| Grade: 10-11 | <p style="text-align: center;">Subject: Technology Education- Alternative Energy Engineering 3</p> |
| CTE Standard | <p><i>Pre-Engineering Technology Standards</i></p> <p><i>E. Teamwork: Explain the characteristics of an effective design team and the process.</i></p> <p><i>F. Technology: Identify and demonstrate the use of various software programs used in the engineering field.</i></p> <p>READING STANDARDS</p> <p>6) MAKE CONNECTIONS BETWEEN THE TEXT AND OUTSIDE EXPERIENCES AND KNOWLEDGE</p> <p>8) USE EVIDENCE FROM THE TEXT TO DRAW AND/OR SUPPORT A CONCLUSION</p> <p>MATHEMATICS STANDARDS</p> <p>1) EXTEND THE UNDERSTANDING OF NUMBER TO INCLUDE INTEGERS, RATIONAL NUMBERS AND REAL NUMBERS</p> <p>2) INTERPRET AND REPRESENT LARGE SETS OF NUMBERS WITH THE AID OF TECHNOLOGIES</p> <p>4) DEVELOP AND EVALUATE MATHEMATICAL ARGUMENTS USING REASONING AND PROOF</p> |
| Enduring Understanding | <ul style="list-style-type: none"> ● Products are a result of human inputs, processes and feedback. ● Different materials require different processes and safety considerations. ● Safety habits are learned behaviors. ● Leadership is a learned behavior. ● Practice makes permanence; make sure your building good habits. |

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- Effective problem solvers work to understand the problem before attempting a solution.
- An impossible problem can be made possible by applying what you already know.
- Technological understanding requires learning and doing.
- Decisions about what to use and how to use it, affects the end result.
- Technology is neutral; its use however has positive and/or negative consequences.
- Trial and Error is a form of innovation.
- Research develops knowledge, which instills invention and enhances innovation.
- Technology is the result of a creative act.
- Technology is ever changing.
- Energy is critical to human development.
- Technology is used to increase the capacity of our environment to support life.
- Land, fluid, gas and space environments bring challenges to technological practices.
- New and emerging technologies influence educational needs.
- Attention to details can make ordinary work extraordinary.
- Answers to critical questions narrow the problem.
- Think before performing.
- Team success depends on communication and collaboration.
- Research and Development is a complex process that has constraints.
- Communication processes are essential for society's development.

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| <p>Essential Questions</p> | <ul style="list-style-type: none"> ● Did the product meet the initial goal approved? ● Identify you participation with respect to the various tasks you participated in that resulted in a positive affect on the goal. ● Did the materials function the way they were intended? ● Did the processing techniques work as was initially projected? ● Did quality control measures influence the end result? ● What recommendations would you suggest to improve the process undertaken? ● Did the organization structure meet the needs of the mission? ● Did the timeline provide the appropriate framework for the project? ● Did the initial problem-solving process address all the constraints that were externally acting upon the goal? ● What suggestions would you provide to improve the process? |
| <p>Content Standard:</p> | <p><i>Pre-Engineering Technology Standards</i></p> <p><i>E. Teamwork: Explain the characteristics of an effective design team and the process.</i></p> <p>20. Contribute to a team project.</p> <p>21. Identify characteristics of an effective design team (e.g., leadership, responsibility, respect, rapport and time management).</p> <p><i>F. Technology: Identify and demonstrate the use of various software programs used in the engineering field.</i></p> <p>22. Identify available resources for researching problem solutions.</p> <p>23. Use word processing software to develop reports.</p> <p>24. Use presentation software to develop oral presentation of findings.</p> <p>25. Describe and demonstrate the process for using CAD in a design solution.</p> <p>26. Use spreadsheet software to develop tables, graphs and charts and track data.</p> <p>READING STANDARDS</p> <p>6) MAKE CONNECTIONS BETWEEN THE TEXT AND OUTSIDE</p> |

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EXPERIENCES AND KNOWLEDGE

- Students recognize and appreciate that contemporary and classical literature has shaped human thought
- Students interpret, analyze and evaluate text in order to extend understanding and appreciation
- Students communicate with others to create interpretations of written, oral and visual texts
- Students select and apply strategies to facilitate word recognition and develop vocabulary in order to comprehend text
- Students use appropriate strategies before, during and after reading in order to construct meaning

8) USE EVIDENCE FROM THE TEXT TO DRAW AND/OR SUPPORT A CONCLUSION

- Students interpret, analyze and evaluate text in order to extend understanding and appreciation
- Students communicate with others to create interpretations of written, oral and visual texts
- Students use appropriate strategies before, during and after reading in order to construct meaning

MATHEMATICS STANDARDS

1) EXTEND THE UNDERSTANDING OF NUMBER TO INCLUDE INTEGERS, RATIONAL NUMBERS AND REAL NUMBERS

- Compare, locate, label and order real numbers on number lines, scales, coordinate grids and measurement tools
- Select and use an appropriate form of number (integer, fraction, decimal, ratio, percent, exponential, scientific notation, irrational) to solve practical problems involving order, magnitude, measures, labels, locations and scales.

2) INTERPRET AND REPRESENT LARGE SETS OF NUMBERS WITH THE

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| | <p>AID OF TECHNOLOGIES</p> <ul style="list-style-type: none"> • Use technological tools such as spreadsheets, probes, computer algebra systems and graphing utilities to organize and analyze large amounts of numerical information. <p>4) DEVELOP AND EVALUATE MATHEMATICAL ARGUMENTS USING REASONING AND PROOF</p> <ul style="list-style-type: none"> • Recognize the validity of an argument • Create logical arguments to solve problems and determine geometric relationships |
| <p>Performance Expectations (Student outcomes)</p> | <ul style="list-style-type: none"> ● Did the product meet the initial goal approved? ● Identify your participation with respect to the various tasks you participated in that resulted in a positive effect on the goal. ● Did the materials function the way they were intended? ● Did the processing techniques work as was initially projected? ● Did quality control measures influence the end result? ● What recommendations would you suggest to improve the process undertaken? ● Did the organization structure meet the needs of the mission? ● Did the timeline provide the appropriate framework for the project? ● Did the initial problem-solving process address all the constraints that were externally acting upon the goal? ● What suggestions would you provide to improve the process? |

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| Strategies/Modes | Materials/Resources (examples) | Assessments (examples) |
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| <ul style="list-style-type: none"> ● Class discussion ● Lab activity- Reading Assignments- Internet Articles ● Textbook- | <ul style="list-style-type: none"> ● Textbook- ● Supplementary materials. | <p>Evidence of understanding Participation in class discussions. Evidence of appropriate research ability. Research a product and present it past, present and projected future development processes. Evidence of a T chart identification process. Completion of design briefs Unit Quiz</p> |