

DEPARTMENT: TECHNOLOGY EDUCATION	COURSE TITLE: ENGINEERING & TECHNOLOGY II COURSE NUMBER: 537
GRADE(S): 9-12	PRE-REQUISITES (IF ANY): ENGINEERING & TECHNOLOGY I OR PERMISSION OF THE TEACHER

UNIT	LENGTH	CONTENT	SKILLS	METHODS OF ASSESSMENT	FRAMEWORK STRAND(S) & STANDARD(S)
Safety	2 days formally and on-going through-out the course	<ul style="list-style-type: none"> The evacuation procedures and the placement and use of safety equipment (exhaust fans, emergency shut-offs, fire extinguishers, eye wash units and safety glass cabinets) The selection and use personal safety devices (safety glasses, ear protection, lab coats, welding shields, leather and plastic gloves) when in the laboratory environment The Material Safety Data Sheet (MSDS) Danger zones or areas for machine operators and non-operators for the: band saw, drill press, machine lathe, power hack saw, circular saw, spot, arc and acetylen welders and grinder 	<p>Students will:</p> <ul style="list-style-type: none"> Demonstrate the evacuation procedure for this lab and be able to identify where safety devices and equipment are kept and how to use them Follow the safety guidelines without reminders when in a working lab environment Identify the purpose of a Material Safety Data Sheet and end give a general overview of the types of information one could find on this document 	<ul style="list-style-type: none"> Written quiz on procedures and safety devices Observation of the adherence to guidelines covered throughout the entire course Ability to explain the role and primary information one can obtain from an MSDS 	STE-4, 9/10, 7.2
Problem Solving Sequence and Universal Systems Model	2 days formally and throughout the course	<ul style="list-style-type: none"> The Problem Solving Sequence and the Universal Systems Model 	<p>Students will:</p> <ul style="list-style-type: none"> Identify and define the 8 steps of the Engineering Problem Solving Sequence Identify and define the categories within the Universal Systems Model 	<ul style="list-style-type: none"> Participation in discussions Written quizzes Application of the principles during lab activities 	
The Nature of & Principle Sources of Energy	2 days	<ul style="list-style-type: none"> How energy produces motion, heat and light The six different forms of energy and the Law of Conservation of Energy The differences between potential and kinetic energy 	<p>Students will:</p> <ul style="list-style-type: none"> Explain how the six different forms of energy can be used to produce motion, heat and/or light Define and give examples of the Law of Conservation of Energy Define and give examples of kinetic and potential energy 	<ul style="list-style-type: none"> Participation in discussions Written quizzes 	STE- S-4 9/10-4.1, 4.2 , 4.5
The Control of Energy	2 days	<ul style="list-style-type: none"> The main elements of energy control systems 	<p>Students will:</p> <ul style="list-style-type: none"> Define an energy control system and identify the primary component parts Identify the component parts that control the electrical system from the generation plant to the wall outlet in a house or a school 	<ul style="list-style-type: none"> Participation in discussions Written quizzes 	STE- S-4 9/10-5.1, 5.2

Emerging Sources of Alternative Energy and Alternative Devices	4 days	<ul style="list-style-type: none"> Fuel cells, solar cells, electric vehicles, magnetic levitation vehicles, fusion reaction and other new innovations 	<p>Students will:</p> <ul style="list-style-type: none"> Compare and contrast traditional and non-traditional or emerging methods of generating power and discuss appropriate applications Compare and contrast traditional and non-traditional or emerging transportation devices and identify where they could be most effectively used Calculate the efficiency of solar cells 	<ul style="list-style-type: none"> Participation in class discussions Quizzes, tests and worksheets Research paper 	<p>STE- S-4 9/10-4.1, 4.2, 4.3, 4.4, 5.2,</p> <p>STE- S3 9/10-5.1, 5.3,</p> <p>M- 10.G.9 &10 10.M.2</p>
Solar Energy	3 weeks	<ul style="list-style-type: none"> Methods and mechanisms used to collect, store and control solar energy Solar energy devices 	<p>Students will:</p> <ul style="list-style-type: none"> Identify and define mechanisms used in the collection, storage and control of solar energy Apply the principles of collection, storage and control of solar energy to a solar energy device designed and produced by the student Orally present their findings and prototype to the class 	<ul style="list-style-type: none"> Class discussion Design and production of a devise that is powered by solar energy 	<p>STE- S3 9/10-5.1, 5.3, 3.1, 3.4, 2.1, 2.2, 2.4</p> <p>STE- S4 9/10-3.1, 4.1, 4.2, 4.3, 4.4, 4.5, 5.1, 5.2, 5.3, 5.4, 5.5, 7.2</p> <p>ELA- 24.5</p>
Measuring Energy & Power	2 days	<ul style="list-style-type: none"> The two major measurement systems used in the world: power and energy measurement and terminology Common formulas used to quantify power and energy 	<p>Students will:</p> <ul style="list-style-type: none"> Define and appropriately use the terms; horse-power, metric units, standard US measurements, pressure, force, calorie, watt, area and torque Calculate horsepower, pressure, force, distance, rpm, area, volume and circumference 	<ul style="list-style-type: none"> Class discussions Worksheets Quizzes and tests Application of formulas during prototype construction 	<p>STE- S3 9/10-2.6</p> <p>STE- S4 9/10-5.5</p> <p>M- 10N4, 10p8, 10M1&2</p>
Principles of Energy Conservation	2 days	<ul style="list-style-type: none"> The principles of conservation of energy resources for transportation, home, commercial and industrial settings/uses 	<p>Students will:</p> <ul style="list-style-type: none"> Explain why conservation of energy is important in the short and long term Identify and explain where significant energy savings could be had in home, commercial, industrial and transportation sectors Define the terms: R-value, energy efficiency rating, co-generation, recycling, reuse and conservation practices 	<ul style="list-style-type: none"> Class discussions Worksheets Quizzes and tests 	<p>STE-S3 9/10-2.1</p> <p>STE-S4 9/10-4.1, 4.2, 4.3, 4.4, 4.5</p>
Effects of Energy Use on the Environment	2 days	<ul style="list-style-type: none"> The terminology relating to pollution and its effects 	<p>Students will:</p> <ul style="list-style-type: none"> Define and explain common terminology related to the generation of pollution and the control of pollution in 	<ul style="list-style-type: none"> Class discussions Worksheets Quizzes and tests 	

			relation to the generation of energy	<ul style="list-style-type: none"> Research Project 	
Principle of Magnetism and Electricity	4 days	<ul style="list-style-type: none"> The relationship between the charges of neutrons, protons and electrons and the structure of the atom The characteristics of conductors and insulators How electrons flow in a conductor and be able to explain magnetic polarity and the characteristics of a magnetic field How to use and apply ohms law and explain current flow through a series and parallel circuit 	<p>Students will:</p> <ul style="list-style-type: none"> Diagram an atom of a good conductor and explain how electrons flow through a good conductor Explain magnetic lines of force and the relationship to magnetic poles, electro-magnets and current flow Calculate and measure wattage, current flow, voltage and resistance in series and parallel circuits 	<ul style="list-style-type: none"> Labs and worksheets Quizzes Application of principles in prototype building 	<p>STE- S3 9/10-5.3, 5.4, 5.5</p> <p>STE- S4 9/10-5.1, 5.2, 5.3, 5.4, 5.5, 5.6</p> <p>M- 8P1</p>
Plans and Drawings	2 days formally and through the course	<ul style="list-style-type: none"> The planning and drawing process for the development of working drawings and plans for the construction of prototypes. 	<p>Students will:</p> <ul style="list-style-type: none"> Sketch out preliminary ideas, produce orthographic and isometric drawings of components, develop parts lists and correctly sequence construction steps for their prototype 	<ul style="list-style-type: none"> Neatness, accuracy and completeness of the plans, parts list and step sequence 	<p>STE- S4 9/10-1.1, 1.2, 1.3, 1.5</p> <p>M- 10.G.10</p>
Investigation of Alternative Transportation Systems Students will build a prototype /model magnetic levitation vehicle	3 weeks	<ul style="list-style-type: none"> Alternative transportation vehicles 	<p>Students will:</p> <ul style="list-style-type: none"> Identify and describe non-traditional forms of transportation (such as: electric powered, magnetic levitation, hybrid) Compare and contrast non-traditional forms of transportation to traditional fossil fuel vehicles Design and construct a working model of a non-traditional transportation system Present their findings and prototype to the class 	<ul style="list-style-type: none"> Participation in discussions Written quizzes Application of the principles during lab activities Research Project Prototype 	<p>STE- S4 9/10-1.1, 1.2, 2.1, 2.4, 5.4, 7.2</p> <p>STE-S3- 2.2-2.4 & 2.6</p> <p>ELA- 24.5</p>
Tools and Machines	2 days formally and through the course	<ul style="list-style-type: none"> The names of and the safe and proper use of tools and machines necessary to construct the prototype 	<p>Students will:</p> <ul style="list-style-type: none"> Identify common tools and machines in the lab Select the correct tool for the job and safely use that tool 	<ul style="list-style-type: none"> Quizzes and worksheets Appropriate use tools and machines during the building of the prototype Performance tests on machines 	<p>STE- S4 9/10-7.2</p>

Materials and Their Properties	1 day formally and through the course	<ul style="list-style-type: none"> Materials (and their characteristics) available to them in the lab 	<p>Students will:</p> <ul style="list-style-type: none"> Identify and explain the characteristics of prototype building materials common in the lab in relation to density, strength, conductivity, flexibility, machinability, weight other characteristics as needed 	<ul style="list-style-type: none"> Appropriate selection of materials during prototype building Class discussions Quizzes and worksheets 	STE- S4 9/10-2.4
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