2012/2013 Course Description
CTE504 -- Green Technology Engineering
36 weeks

Student	**School Year**
Grade	**Term (fall, spring)**
School	**Teacher Signature**

Major Concepts/Content: The Green Technology course teaches high school students the engineering and design processes in alternative and renewable energy systems. Students progress at their own pace while studying and performing tasks independently and in small groups. Lessons are delivered in an atmosphere of differentiated learning using hands-on activities. Learning is supplemented with demonstrations, mentorship, and study trips that will familiarize students with the concepts and application of green technologies. Students will gain first-hand knowledge by performing laboratory experiments that immolate the industry of our future energy systems.

Major Instructional Activities: Workplace readiness skills, understanding energy consumptions, investigating renewable energy systems and career exploration will be studied. During the course of study students will study, through project-based learning, the concepts of transportation fuels and energy systems which will substantially reduce life-cycle greenhouse gas emissions. The project-based learning model will require students to integrate science, technology, engineering and mathematics (STEM), and be innovative thinkers within the realm of green technology engineering. Students will distinguish between renewable and non-renewable energy systems through the application of STEM to real world scenarios via laboratory practices, computer applications and emulations.

Major Evaluative Techniques: Students will demonstrate their knowledge through tests, hands-on demonstrations, technical reports, and projects.

CTE501 36 weeks	Green Technology Engineering **TASKS/COMPETENCIES**
• 001	Demonstrate DoDEA's Workplace Readiness Skills in course activities.
• 002	Identify Internet safety issues and procedures for complying with acceptable use standards.
• 003	Identify issues relating to this field of study that affect the environment and impact local and global communities.
Set Expectations for Student Success	
• 004	Distinguish between renewable and non-renewable energy systems.
• 005	Apply STEM to real world scenarios.
• 006	Use appropriate computer applications to solve problems.

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Relating Safety to Green Technology Engineering	
• 007	Adhere to accepted laboratory safety practices.
• 008	Identify safety precautions necessary when using tools and materials.
• 009	Locate and refer to Material Data Safety Sheets (MSDS).
• 010	Match Personal Protective Equipment (PPE) to specific activities.
Identify Renewable Energy Systems	
• 011	List renewable energy systems.
• 012	Distinguish between renewable energy systems.
• 013	Compare and Contrast renewable and non-renewable energy systems.
• 014	Identify the need for renewable energy systems.
• 015	List maintenance needs for continuous operation of an energy system.
• 016	Recognize that recycling is essential to product's definition.
• 017	Explain how and why the law of conservation of energy applies to the transformation of various forms of energy (including mechanical energy, electrical energy, chemical energy, light energy, sound energy, and thermal energy).
Applying the Engineering Design Process	
• 018	Articulate the engineering design process.
• 019	List and define the three phases used in most engineering designs.
• 020	Apply the engineering design process to address problems that can be solved by green technology.
• 021	Describe the objectives of the feasibility study.
• 022	Explain the use of the evaluation table during the preliminary design phase.
• 023	Determine sources of information available for problem solving.
• 024	Describe the use of sketches and detail and assembly drawings in the design process.
• 025	Select appropriate materials and processes for a design project.
• 026	Formulate an alternate design solution to a problem.
• 027	
Understanding the Impact of Continued Use of Non-Renewable Energy Resources	
• 028	Interpret the need to reverse the impact of using carbon-based energy.
• 029	Discuss the value of renewable energy resources.
• 030	Predict the impact of the depletion of non-renewable energy resources.
Investigating Renewable Energy Systems	
• 031	Derive ways to create renewable energy systems.
• 032	Understand the basic concepts of renewable energy systems to include wind, hydroelectric, fuel cells, solar and biomass.
• 033	Identify the sources of renewable energy systems to include wind, hydroelectric, fuel cells, solar and biomass.
• 034	Identify the uses of renewable energy systems to include wind, hydroelectric, fuel cells, solar and biomass.
• 035	Apply math and scientific principles as related to renewable energy systems to include wind, hydroelectric, fuel cells, solar and biomass.
• 036	Apply and describe the energy concepts for renewable energy systems to include wind, hydroelectric, fuel cells, solar and biomass.

• 037	Apply and describe the electricity concepts for renewable energy systems to include wind, hydroelectric, fuel cells, solar and biomass.
• 038	Understand the structure and properties of atoms.
• 039	Distinguish chemical properties of matter (including reactivity) from physical properties of matter (including boiling point, freezing/melting point, density [with density calculations], solubility, viscosity and conductivity).
• 040	Compare the properties of the four states of matter—solid, liquid, gas and plasma—in terms of the arrangement and movement of particles.
• 041	Apply procedure to balance equations for a simple synthesis or decomposition reaction.
• 042	Explain the effects of temperature, concentration, surface area, and the presence of a catalyst of reaction rates.
Understanding Energy Consumption and Efficiency	
• 043	Define smart energy.
• 044	Calculate the consumption of energy needs of the consumer.
• 045	Understand the regulatory structure of a geographic area.
• 046	Evaluate a technological design or product on the basis of designated criteria (including cost, time and materials).
• 047	Explain the factors that determine potential and kinetic energy and the transformation of one to another.
Developing and Applying STEM to Optimize Renewable Energy Solutions	
• 048	Calculate production methods to achieve optimum output.
• 049	Design a renewable energy system.
• 050	Construct a model exemplifying renewable energy systems.
• 051	Record output data from each renewable energy system.
• 052	Compare the functioning of simple electrical circuits.
• 053	Explain the motion of objects on the basis of Newton's three laws of motion: inertia; the relationship among force, mass and acceleration; and action and reaction forces.
• 054	Explain the relationships among voltage, resistance, and current in Ohm's Law.
• 055	Develop the abilities to use and maintain technological products and systems.
Developing Career Exploration and Employability Skills	
• 056	Investigate Green Technology Engineering skills
• 057	Identify personal characteristics of a professional green technology engineer.
• 058	Create or update a portfolio containing representative samples of student work.
• 059	Identify personal presentation standards expected during interviews.
• 060	Identify the difference between an engineer, a scientist and a technologist through their job classifications.
• 061	Investigate profiles of engineers and engineering students.