COURSE OUTLINE DEVELOPMENT

1. **Course Title:** **Introduction to Energy Generation Theory**
2. **CBEDS Title:** **Exploring Energy and Utilities**
3. **CBEDS Number:**
4. **Job Titles:** **Solar System Installers; Wind Turbine Technicians; Ethanol and Biodiesel Production Technician; Alternative Fuel Technician; Insulation and Weatherization Workers; Solar Panel Installers; Energy Auditors; Chemical, Civil, Conservation, Biological, Agricultural, Electrical Environmental and Mechanical Engineers.**

5. Course Description:

This course is the Skill Building Level course in the Energy & Utilities Pathway and prepares high school students for work in entry-level positions through classroom instruction, hands-on training and community experience. This pathway encompasses career opportunities in a variety of jobs in which the main focus is ensuring sustainable energy resources. The careers included in this pathway primarily address engineers, installers, technicians.

Students understand basic concepts designed to introduce them to the growing global demand for energy. Students will learn how alternative or renewable energy sources can impact the amount of toxins that are by-products of energy used. Instruction will focus on understanding the multitude of careers in the field of Energy and Utilities and the various industry certifications available in the industry. Integrated throughout the course are career preparation standards, which include basic academic skills, communication, interpersonal skills, problem solving, and workplace safety, technology and employment literacy connection to core academic standards.

Energy & Utilities Pathway	
Introductory	Earth Science
Skill Building	**Introduction to Energy Generation Theory**
Advanced	Advanced Energy Generation Theory

Students will:

1. Differentiate between renewable and non-renewable energy sources
2. Identify alternative energy use impact on the ecological balance of the planet and conservation of non-renewable energy sources
3. Compare and contrast alternative energy resources:
    a. Solar
    b. Wind
    c. Water, hydro-electric, and tides
    d. Geothermal
    e. Hydrogen
    f. Nuclear
    g. Biomass
4. List key policy and legislative mandates affecting the industry
5. Understand the requirements for various industry certifications.

6. Hours: **180 hours**
7. Prerequisites: **None**
8. Date: **February 2010**

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Upon successful completion of this course, students will be able to demonstrate the following skills necessary for entry-level employment.

Instructional Units and Competencies Guaranteed curriculum = regular font Negotiated curriculum = italicized	**Course Hours**	**Model Curr. Standards**	**CA Academic Content Standards**	**CAHSEE**
I. CAREER PREPARATION A. Career Planning and Management. 1. Know the personal qualifications, interests, aptitudes, knowledge, and skills necessary to succeed in careers. a. Students will identify skills needed for job success b. Students will identify the education and experience required for moving along a career ladder. 2. Understand the scope of career opportunities and know the requirements for education, training, and licensure. a. Students will describe how to find a job. b. Students will select two jobs in the field and map out a timeline for completing education and/or licensing requirements. 3. Know the main strategies for self-promotion in the hiring process, such as completing job applications, resume writing, interviewing skills, and preparing a portfolio. a. Students will write and use word processing software to create a resume, cover letters, thank you letters, and job applications. b. Students will participate in mock job interviews. 4. *Develop a career plan that is designed to reflect career interests, pathways, and postsecondary options.* *a. Students will conduct a self—assessment and explain how professional qualifications affect career choices.* *5. Understand the role and function of professional organizations, industry associations, and organized labor in a productive society.* *a. Contact two professional organization and identify the steps to become a member.* *6. Understand the past, present and future trends that affect careers, such as technological developments and societal trends, and the resulting need for lifelong learning.* *a. Students will describe careers in the business industry sector.* *b. Students will identify work-related cultural differences to prepare for a global workplace.* B. Technology. 1. Understand past, present and future technological advances as they relate to a chosen pathway and on selected segments of the economy. 2. Understand the use of technological resources to gain access to, manipulate, and produce information, products and services. 3. Use appropriate technology in the chosen career pathway. C. Problem solving and Critical Thinking. 1. Understand the systematic problem-solving models that incorporate input, process, outcome and feedback components, and apply appropriate problem-solving strategies and critical thinking to work-related issues and tasks.	20 Additional hours are integrated throughout the course.	Finance & Business Industry Sector, Model Curriculum Standards 3.0, 4.0, 5.0, 6.0, 7.0, 8.0, 9.0, 10.0	Language Arts (8) R 1.3, 2.6 W1.3, 2.5. LC 1.4,1.5, 1.6 LS1.2, 1.3, (9/10) R2.1,2.3,2 W2.5 LC1.4 LS 1.1, 2.3 (11/12) R2.3 W2.5 LC1.2 Math (7) NS1.2, 1.7 MR 1.1,1.3 2.7,2.8, 3.1	Lang. Arts R 8.2.1 (9/10) R 2.1, 2.3 W2.5 Math (7) NS 1.2, 1.3, 1.7 MR 1.1, 2.1, 3.1

Italicized text references "negotiated" curriculum; all other text references "guaranteed" curriculum.

2. Use and apply critical thinking and decision making skills to make informed decisions, solve problems, and achieve balance in the multiple roles of personal, home, work and community life. D. Health and Safety. 1. Know policies, procedures, and regulations regarding health and safety in the workplace, including employers' and employees' responsibilities. 2. Understand critical elements of health and safety practices related to a variety of business environments. E. Responsibility & Flexibility. 1. Understand the qualities and behaviors that constitute a positive and professional work demeanor. 2. Understand the importance of accountability and responsibility in fulfilling personal, community, and work-place roles and how individual actions can affect the larger community. 3. Understand the need to adapt to varied roles and responsibilities. F. Ethics and Legal Responsibilities 1. Know the major local, district, state, and federal regulatory agencies and entities that affect the industry and how they enforce laws and regulations. 2. Understand the concept and application of ethical and legal behavior consistent with workplace standards. *a. Contact a business and obtain a copy of their rules for employment.* *b. Role play difference ethical scenarios.* 3. Understand the role of personal integrity and ethical behavior in the workplace. G. Leadership and Teamwork. 1. Understand the characteristics and benefits of teamwork, leadership, citizenship in the school, community, and workplace settings for effective performance and attainment of goals. 2. Understand the ways in which professional associations and competitive career development activities enhance academic skills, career choices, and contribute to promote promote employability. 4. Know multiple approaches to personal conflict resolution and understand how to interact with others in ways that demonstrate respect for individual and cultural differences and for the attitudes and feelings of others.				

Instructional Units and Competencies	Hours	Model Curr. Standards.	CA Academic Standards	CAHSEE
I Climate Change and Sustainability: A. Students will define sustainability. 1. Students will identify the impact on the ecological balance of the planet. 2. Students will describe the impact of non-renewable energy sources on the planet. 3. Students will describe the impact on social and economic systems 4. Students will compare and contrast 21st century challenges including population growth, decline of natural systems, increased consumption of goods and services, increased disturbances to the environment, and pollution. 5. Students will calculate their carbon footprint. 6. Students will demonstrate an understanding of their own contribution to resource depletion. B. Climate change: 1. Students will discuss the effects of global warming and measures that can be taken to mitigate the impacts. 2. Students will examine climate change from both a local and global perspective. 3. Students will research the role sustainable development plays in alleviating climate change and other pressures on the environment. 4. Students will be able to define: climate change, carbon footprint, ecological footprint, global warming potential, greenhouse gases, and resource interrelationships.	6			
II. Fundamentals of Energy: A. Energy sources: 1. Students will define and distinguish between renewable and non-renewable resources. 2. Students will describe the economic, social, and environmental pros and cons of both sources energy. 3. Students will debate the advantages and disadvantages of both energy sources. 4. Students will be able to define: carbon neutral, energy density, fossil fuels, non-renewable energy source, and renewable energy source. 5. Activities: I. In small groups, students will use the internet to research the pros and cons of one energy source and debate their findings to the whole class. II. Students will take notes during each group debate, discuss energy sources, and write a one page report addressing which energy source is more beneficial for powering America. B. Power production and transmission: 1. Students will map the pathway of electricity from the power plant to its end use.	10			

2. Students will identify the power mix used by their utility to produce electricity and explain the environmental concerns of electricity production as a context for the importance of energy efficiency and renewable energy. 3. Activities: I. In small groups, students will brainstorm ways to reduce the amount of electricity that is lost between the power plant and the home and report out to the entire class. II. In small groups, students will list ways of improving the efficiency of power plants. III. As a class, students will explore what happens to their personal carbon footprint when the utility company changes its mix. IV. Either individually or in small groups, students will explore a new power plant for their community and complete a handout for class discussion. C. Electricity: Power vs. Energy: 1. Students will explain how electricity flows in a circuit. 2. Students will distinguish between electrical power and electrical energy. 3. Students will determine the energy consumption of a device by its power requirement and hours of operation. 4. Students will calculate energy consumption, cost, and CO2 emissions resulting from operating an electrical device. 5. Activities: I. Students will complete a handout with three questions regarding ways to reduce energy consumption and participate in a class discussion.				
III. Tackling Energy Waste: A. Measuring energy consumption 1. Students will explain the purpose of electrical meters in tracking energy consumption. 2. Students will accurately read and utilize electrical meters to quantify household energy consumption and to measure savings. 3. Students will identify and implement measures at home to generate energy savings. 4. Activities: I. Students will complete a handout by calculating energy use of their household before and after implementing energy saving actions. II. Students will share finding with the class and identify the top energy savings tips. B. Energy efficient measures – overhead lighting: 1. Students will identify standard lighting types and their components. 2. Students will calculate energy consumption and cost to operate light fixtures. 4. Activities:				

I. Students will analyze the number of ceiling light fixtures and incandescent/CFL light bulbs in the classroom and identify the lamps in each fixture. II. Students will used a flicker checker to determine whether the overhead lighting is using electronic or magnetic ballasts, and TI or T12 lamps. III. Students will brainstorm ways to conserve energy and reduce classroom use of lighting. C. Energy efficient measures – de-lamping assessment: 1. Students will use a light meter to measure the luminance of classroom. 2. Students will identify de-lamping opportunities and calculate energy savings based on the recommendations. 3. Activities:				

10. Additional recommended/optional items

a. Articulation: None

b. Academic credit: None

c. Instructional strategies:

Methods of Instruction:

1. Lecture
2. Audio Visual Materials
3. Research Readings and Written Presentations
4. Group & Individual Activities
5. Quizzes, Tests & Final Exam
6. Internet Exploration
7. Guest Speakers
8. Activities:
   - Career Awareness
   - Guest Speakers
   - Field Trips

d. Instructional materials: Text to be determined.

e. Certificates: None