

ESS 0007 - ENERGY, ENVIRONMENT, AND CLIMATE

Catalog Description

Also known as ESCI 7

Advisory: Eligibility for ENGL 1A

Hours: 54 lecture

Description: Analysis of the nature of energy and the environmental impact of its societal use in the context of Earth's record of changing climate. Explores current global climate change due to post-1750 greenhouse gas emissions and strategies for mitigation and adaptation to changing climate predictions, emphasizing future alternative energy sources. Designed for students majoring in areas related to the environmental sciences and/or those interested in developing a substantiated understanding of the role played by citizens in ensuring a healthy environment for future generations. (CSU, UC)

Course Student Learning Outcomes

- CSLO #1: Apply the principles of energy in the context of the earth system in human activity.
- CSLO #2: Assess the consequences of energy development on earth ecosystems.
- CSLO #3: Discuss and evaluate the role of alternative energy sources and energy conservation in developing sustainable communities.

Effective Term

Fall 2018

Course Type

Credit - Degree-applicable

Contact Hours

54

Outside of Class Hours

108

Total Student Learning Hours

162

Course Objectives

1. Describe the general aspects of Earth's planetary history, including climate change over time;
2. Compare and contrast energy flow and energy fuel;
3. Assess the role of human-caused changes in the planet's climate;
4. Discuss the differing uses of energy sources by modern society;
5. Distinguish between forms of energy;
6. Explain how electricity is 'made' and stored;
7. Compare and contrast energy units;
8. Relate energy to work;
9. Compare and contrast conduction and convection;
10. Contrast the energy requirements for heat capacity and phase change;
11. Distinguish between amount and quality of energy;

12. Compare and contrast a heat engine and a refrigerator;
13. Discuss the origins, resource, technologies, environmental impact, and selected policy issues of current and future energy sources (for example, fossil fuels, nuclear, geothermal, tidal, solar, hydroelectric, wind, biofuels, hydrogen, and fusion);
14. Analyze the interactions between Earth's surface and atmosphere in the context of the planet's average energy balance;
15. Evaluate the role of greenhouse gases in our atmosphere;
16. Assess the impact of changes in the factors controlling Earth's energy balance;
17. Analyze historical and prehistorical records of temperature;
18. Assess the validity of climate models and their climate projections;
19. Discuss the consequences of global climate change;
20. Assess strategies for mitigation and adaptation to global climate change;
21. Discuss the role of alternative energy sources and energy use curbing in sustainability.

General Education Information

- Approved College Associate Degree GE Applicability
 - AA/AS - Physical Sciences
- CSU GE Applicability (Recommended-requires CSU approval)
 - CSUGE - B1 Physical Science
- Cal-GETC Applicability (Recommended - Requires External Approval)
- IGETC Applicability (Recommended-requires CSU/UC approval)
 - IGETC - 5A Physical Science

Articulation Information

- CSU Transferable
- UC Transferable

Methods of Evaluation

- Classroom Discussions
 - Example: After viewing several short videos on emerging technologies in wave energy, discuss among peers and report out the advantages and disadvantages of each one. Evaluation will be based on the quality of analysis.
- Objective Examinations
 - Example: Analyze a given chart of breakdown of energy use by type for a number of countries and write three statements that summarize the information given. Performance will be evaluated based on the depth of insight of the statements.
- Projects
 - Example: Assess an assigned building on campus in terms of the elements of passive solar design. Students will be evaluated based on how well their answers match the given rubric.

Repeatable

No

Methods of Instruction

- Lecture/Discussion
- Distance Learning

Lecture:

1. Instructor will present graphs showing the variation of carbon dioxide concentration in Earth's atmosphere over different scales of time, including the amounts that resulted from human burning of fossil

fuels and then lead a discussion on the impact of the latter on the former.

2. Instructor will explain the components of passive solar heating, and then have students evaluate different given images of homes in terms of these elements, indicating how successful each design is.

Distance Learning

1. Instructor will provide a discussion prompt on the tangible impact of global warming trends based on a set of particular research examples, such as sea level rise or number of summer days with a probability of 90% or higher of temperatures exceeding 95 degrees Fahrenheit. Students will generate an initial post, and then respond to another student's post.
2. Instructor will provide an example of how a state can move towards sustainability in their energy needs. Students will be assigned a state, and they will generate a presentation (visuals, audio) along the same lines.

Typical Out of Class Assignments

Reading Assignments

1. Read chapter in textbook on Environmental Impact of Fossil Fuels and be prepared to discuss in class.
2. Read paper on study of afforestation of Shasta County range lands by the Public Interest Research Program (PIER) of the California Energy Commission and be prepared to discuss the opportunities.

Writing, Problem Solving or Performance

1. Write a reflection paper on the evidence for recent temperature increases and their effect on sea level.
2. Create a table that presents the advantages and disadvantages of two alternative sources of energy of your choice, such as Wind and Solar.

Other (Term projects, research papers, portfolios, etc.)

Required Materials

- Energy Environment and Climate
 - Author: Wolfson, Richard
 - Publisher: W.W. Norton & Company
 - Publication Date: 2011
 - Text Edition: 2nd
 - Classic Textbook?:
 - OER Link:
 - OER:
- Energy and Climate: Vision for the Future
 - Author: McElroy, Michael
 - Publisher: Oxford University Press
 - Publication Date: 2016
 - Text Edition: 1st
 - Classic Textbook?:
 - OER Link:
 - OER:
- Energy and Climate Change: Creating a Sustainable Future
 - Author: Coley, David
 - Publisher: Wiley

- Publication Date: 2011
- Text Edition: 1st
- Classic Textbook?:
- OER Link:
- OER:
- Energy: Its Use and the Environment
 - Author: Hinrichs, Roger, and Merlin H. Kleinbach
 - Publisher: Cengage Learning
 - Publication Date: 2012
 - Text Edition: 5th
 - Classic Textbook?:
 - OER Link:
 - OER:

Other materials and-or supplies required of students that contribute to the cost of the course.