ENSC M03: ENERGY RESOURCES AND CONSERVATION

Originator
bswartz

Co-Contributor(s)

Name(s)
Putnam, Roger (rputnam)

College
Moorpark College

Discipline (CB01A)
ENSC - Environmental Science

Course Number (CB01B)
M03

Course Title (CB02)
Energy Resources and Conservation

Banner/Short Title
Energy Resource/Conserv

Credit Type
Credit

Start Term
Fall 2022

Catalog Course Description
Surveys the energy resources that power our global civilization. Includes conventional and alternative methods of energy production, transportation, decarbonization, and the physics of energy use. Emphasizes the application of energy conservation in our economic and technological landscape, with attention to complexities that exist among the 3 Es: energy, the economy, and the environment.

Taxonomy of Programs (TOP) Code (CB03)
0302.00 - Environmental Studies

Course Credit Status (CB04)
D (Credit - Degree Applicable)

Course Transfer Status (CB05) (select one only)
A (Transferable to both UC and CSU)

Course Basic Skills Status (CB08)
N - The Course is Not a Basic Skills Course

SAM Priority Code (CB09)
E - Non-Occupational

Course Cooperative Work Experience Education Status (CB10)
N - Is Not Part of a Cooperative Work Experience Education Program

Course Classification Status (CB11)
Y - Credit Course

Educational Assistance Class Instruction (Approved Special Class) (CB13)
N - The Course is Not an Approved Special Class

Course Prior to Transfer Level (CB21)
Y - Not Applicable

Course Noncredit Category (CB22)
Y - Credit Course

Funding Agency Category (CB23)
Y - Not Applicable (Funding Not Used)

Course Program Status (CB24)
1 - Program Applicable

General Education Status (CB25)
Y - Not Applicable

Support Course Status (CB26)
N - Course is not a support course

Field trips
May be required

Faculty notes on field trips; include possible destinations or other pertinent information
May include participation in an energy production or conservation-related field trip to natural, industrial, or green centers; e.g., UC Santa Barbara, Lion House, American Solar Energy Society (ASES), green homes tour, Strata Solar, Southern California Edison, Simi Valley Landfill and Recycling Center, "Solar Village" (Moorpark College), Ventura coastlines, among other areas that extend from class content on energy, resources, and conservation.

Grading method
(L) Letter Graded

Alternate grading methods
(O) Student Option- Letter/Pass
(P) Pass/No Pass Grading

Does this course require an instructional materials fee?
No

Repeatable for Credit
No

Is this course part of a family?
No

Units and Hours

Carnegie Unit Override
No

In-Class

Lecture
Minimum Contact/In-Class Lecture Hours
52.5
Maximum Contact/In-Class Lecture Hours
52.5

Activity

Laboratory

Total in-Class

Total in-Class
Total Minimum Contact/In-Class Hours
52.5
Total Maximum Contact/In-Class Hours
52.5

Outside-of-Class

Internship/Cooperative Work Experience

Paid

Unpaid

Total Outside-of-Class

Total Outside-of-Class
Minimum Outside-of-Class Hours
105
Maximum Outside-of-Class Hours
105

Total Student Learning

Total Student Learning
Total Minimum Student Learning Hours
157.5
Total Maximum Student Learning Hours
157.5

Minimum Units (CB07)
3
Maximum Units (CB06)
3

Student Learning Outcomes (CSLOs)

	Upon satisfactory completion of the course, students will be able to:
1	demonstrate an understanding of the practical application, effective use, and conservation of energy and other natural material resources.

Course Objectives

	Upon satisfactory completion of the course, students will be able to:
1	apply the basic concepts of physics (efficiencies, heat transfer, laws of thermodynamics) to describe energy transfer in energy production, transmission and usage.
2	describe the origins, productions and fates of various fuel sources such as nuclear fuel, fossil fuels and biofuels.
3	calculate and compare the efficiency of various household fixtures and appliances; calculate fuel efficiency in vehicles, carbon output, and conservation, conduct an energy audit of a home.
4	discuss the effect of recycling and green building techniques on energy consumption.

5	evaluate the effectiveness of renewable energy sources for domestic use and discuss practical application of these sources (solar, wind, hydroelectric, geothermal, ocean, and biomass conversion).
6	assess the economic, social, and environmental impact of energy transitions on a global scale.

Course Content

Lecture/Course Content

- 7.00% Basic physics of energy, the laws of thermodynamics, conservation of mass, energy flow through the ecosystem, ecological efficiency, sustainability principles.
- 6.00% Chemical energy, fossil fuels and biofuels (ethanol, methane, wood, dung): types, supply, utilization, cost.
- 6.00% Geophysical energy: wind turbines, hydroelectric power, ocean wave energy, ocean current turbines, geothermal energy.
- 6.00% Nuclear energy: fission, fusion, safety and waste.
- 5.00% Solar energy: solar collectors - passive and active, efficiencies, cost, tax benefits; artificial photosynthesis and the direct conversion of CO2 to liquid fuel.
- 5.00% Electrical energy: production from other sources, generators, utilization, transmission, distribution and storage, photovoltaics, hydrogen fuel cells, and batteries.
- 6.00% Environmental impact of using non-renewable energy sources: fossil fuel exploration and extraction, acid mine drainage, acid rain, smog.
- 6.00% Energy conservation: general principles of reducing consumption, increasing efficiency, managing sources; environmental impact of conservation.
- 5.00% Conserving energy at the personal level: energy audits and devising a way to implement energy conservation in the home or office.
- 6.00% Cost effectiveness of energy transitions: a look at cost and period until a transition "pays for itself" (a look at renewable alternatives and energy efficient technologies).
- 6.00% Energy conservation and transportation: a look at mass transportation (magnetically levitated trains) and vehicle technologies with respect to energy efficiency, hybrid, biofuels, electric, and hydrogen fuel cells.
- 5.00% Heating, cooling, ventilation, insulation: heating systems (boilers, furnaces, hot water heaters, solar and geothermal) and cooling systems (central air, single units, refrigeration).
- 5.00% Lighting: efficiency of lamps, lighting standards, building design.
- 5.00% Industry: energy management surveys/energy audit.
- 5.00% Water resources: procurement, distribution, storage, utilization, reclamation.
- 5.00% Agriculture: efficiency of equipment, energy in food production (plowing, planting, processing, etc.), using agricultural products for fuel (ethanol and biodiesel).
- 5.00% Energy conservation strategies and future energy demand and supply: informational, economic and regulatory programs.
- 6.00% Building energy-efficient structures and planning a city to conserve energy: incorporating energy conservation into architecture and construction material choice, planning for low energy consuming communities.

Laboratory or Activity Content

NA

Methods of Evaluation

Which of these methods will students use to demonstrate proficiency in the subject matter of this course? (Check all that apply):

Written expression
Skills demonstrations

Methods of Evaluation may include, but are not limited to, the following typical classroom assessment techniques/required assignments (check as many as are deemed appropriate):

Computational homework
Film/video productions
Group projects
Individual projects
Objective exams
Oral analysis/critiques
Oral presentations
Simulations
Skills demonstrations
Written analyses
Written homework
Classroom Discussion
Projects

Participation
Reports/Papers/Journals

Instructional Methodology

Specify the methods of instruction that may be employed in this course

Audio-visual presentations
Case studies
Class activities
Class discussions
Computer-aided presentations
Distance Education
Field trips
Group discussions
Instructor-guided interpretation and analysis
Instructor-guided use of technology
Lecture
Modeling
Problem-solving examples
Readings
Small group activities
Web-based presentations

Describe specific examples of the methods the instructor will use:

Visual, auditory, verbal, kinesthetic, logical, interpersonal, and intrapersonal methods are used. This may include:

1. Strong visuals that drive lectures and class discussions.
2. Linguistic and auditory approaches paired with rhetorical and logical constructs to drive discussions and reasoning.
3. Tactile pedagogical techniques that make students write and draw concepts discussed.
4. Original pictures that students take and share to illustrate class concepts.
5. Class exercises that allow students to deconstruct science as a process, and iterate their own ideas as they explore and test hypotheses.
6. Physical demonstrations that illustrate environmental concepts.
7. Small group work where students showcase creative problem solving as teams.
8. Integration—take-home messages that students read intrapersonally, discuss interpersonally, and synergize for a synthetic comprehension of concepts and methods.

Representative Course Assignments

Writing Assignments

- Complete a write-up of a home energy conservation plan.
- Complete short answer discussion questions about current issues in energy, resources, and conservation.
- Summarize news/views and scientific articles related to energy consumption or conservation.

Critical Thinking Assignments

- Deconstruct the relationship between fossil fuel vs. alternative energy; profile how nuclear energy falls within this landscape; and capture how humanity's energy portfolio falls within the timeline of 2040-2050 clean energy and climate targets.
- Devise a plan to reduce energy waste in the home.

Reading Assignments

- Read weekly take-home messages from class lectures in preparation for class discussions on energy and resources, including articles that are linked to and referenced in those discussions.
- Read targeted scientific papers for a class project on current issues in energy, resource, and conservation.

Skills Demonstrations

- Calculate your carbon footprint.
- Perform a home energy audit.

Outside Assignments

Representative Outside Assignments

- Read assignments from the zero-cost textbook on energy, resources, and conservation, including links to readings from scientific publications.
- Use digital design and modern tech to create an originally recorded presentation on a relevant environmental topic.

Articulation

Equivalent Courses at 4 year institutions

University	Course ID	Course Title	Units
UC Merced	ESS 010	Earth Resources and Society	4
CSU Channel Islands	ESRM 205	Principles of Sustainability	3
UC Berkeley	ESPM C10	Environmental Issues	4

District General Education

A. Natural Sciences

A2. Physical Science
Approved

B. Social and Behavioral Sciences

C. Humanities

D. Language and Rationality

E. Health and Physical Education/Kinesiology

F. Ethnic Studies/Gender Studies

Course is CSU transferable
Yes

CSU Baccalaureate List effective term:
F1995

CSU GE-Breadth

Area A: English Language Communication and Critical Thinking

Area B: Scientific Inquiry and Quantitative Reasoning

B1 Physical Science
Approved

Area C: Arts and Humanities

Area D: Social Sciences

Area E: Lifelong Learning and Self-Development

Area F: Ethnic Studies

CSU Graduation Requirement in U.S. History, Constitution and American Ideals:

UC TCA

UC TCA
Approved

IGETC

Area 1: English Communication

Area 2A: Mathematical Concepts & Quantitative Reasoning

Area 3: Arts and Humanities

Area 4: Social and Behavioral Sciences

Area 5: Physical and Biological Sciences

Area 6: Languages Other than English (LOTE)

Textbooks and Lab Manuals

Resource Type
Textbook

Description
Wolfson, Richard. *Energy, Environment, and Climate.* 3rd ed., W.W. Norton & Company, 2017.

Resource Type
Textbook

Description
Jones, Carla, and Stephen Mayfield. *Our Energy Future: Introduction to Renewable Energy and Biofuels*. University of California, 2016.

Library Resources

Assignments requiring library resources
Research, using the Library's print and online periodical resources, on topics such as home energy analysis and energy usage management.

Sufficient Library Resources exist
Yes

Example of Assignments Requiring Library Resources
Original research for a presentation a current topic in energy, resources, and conservation (e.g., What are the uses and limits of non-conventional oil and gas?; What is the cutting edge of nuclear fission?; What are rare earth elements and what substitutes/ applications are we working on?; etc)

Distance Education Addendum

Definitions

Distance Education Modalities

100% online

Faculty Certifications

Faculty assigned to teach Hybrid or Fully Online sections of this course will receive training in how to satisfy the Federal and state regulations governing regular effective/substantive contact for distance education. The training will include common elements in the district-supported learning management system (LMS), online teaching methods, regular effective/substantive contact, and best practices.

Yes

Faculty assigned to teach Hybrid or Fully Online sections of this course will meet with the EAC Alternate Media Specialist to ensure that the course content meets the required Federal and state accessibility standards for access by students with disabilities. Common areas for discussion include accessibility of PDF files, images, captioning of videos, Power Point presentations, math and scientific notation, and ensuring the use of style mark-up in Word documents.

Yes

Regular Effective/Substantive Contact

100% online Modality:

Method of Instruction	Document typical activities or assignments for each method of instruction
Asynchronous Dialog (e.g., discussion board)	Regular asynchronous discussions that facilitate students to compare/contrast, discuss, identify, analyze, and synthesize course content across lecture and modules. e.g., "After learning about the energy resources that power humanity... What is one new INSIGHT that you've made which you hadn't realized PRIOR to these lectures? How does this insight transform how you think about the world? Explain, with attention to what you used to think vs. what you now see in light of the connections you have made."
E-mail	The class calendar, email, class announcements, and tools such as “Message Students Who” and “Assignment Comments” in Canvas will be used to communicate with all students to clarify class content, remind of upcoming assignments, and provide immediate feedback to students on coursework to facilitate student learning outcomes. Students will be given multiple ways to email instructor through Canvas inbox and faculty provided email account through their own canvas email and school email.
Other DE (e.g., recorded lectures)	Faculty will use a variety of tools and media integrated within the LMS to help students reach SLO such as: • Recorded Lectures, Narrated Slides, Screencasts • Instructor created content • 3rd Party Lab Tools (e.g., Labster) • MC Online Library Resources • Canvas Peer Review Tool • Canvas Student Groups (Assignments, Discussions) • Websites and Blogs • Multimedia (e.g., YouTube, Films on Demand, 3CMedia, Google Earth, earth.nullschool.net, etc.)
Video Conferencing	To remain in sync with students in need, to help, clarify, direct, and assist with learning and success.
Telephone	To remain in sync with students in need, to help, clarify, direct, and assist with learning and success.
Synchronous Dialog (e.g., online chat)	Scheduled synchronous sessions may be organized at the instructor’s discretion to demonstrate skills, address problems, and review asynchronous material. Synchronous sessions may also be used for students to unpack concepts and work on problem together. The platform for such sessions may include ConferZoom or any other approved medium for synchronous dialog.

Primary Minimum Qualification

EARTH SCIENCE

Review and Approval Dates

Department Chair
02/08/2022

Dean
02/08/2022

Technical Review
03/03/2022

Curriculum Committee
03/15/2022

DTRW-I
MM/DD/YYYY

Curriculum Committee
MM/DD/YYYY

Board
MM/DD/YYYY

CCCCO
MM/DD/YYYY

Control Number
CCC000452446

DOE/accreditation approval date
MM/DD/YYYY