General Education Course Proposal

Proposed Course: PSCI (Prefix) 168 (No.) Energy and the Environment (Title) **Units** 3

Department: Physics **College/School:** Science and Mathematics

GE Category (Indicate one category only):

Foundation: A1 __ A2 __ A3 __ B4 __

Breadth: B1 __ B2 __ C1 __ C2 __ D __ E __

Integration: B X C __ D __ International/Multicultural __

Existing Course X **Revised Course** __ **New Course** __

Course Included in Current GE Program __

New courses require the Undergraduate Course Proposal form in addition to this form.
Revised courses require the Undergraduate Course Change Request in addition to this form.

Proposed catalog description: Limit course description to 40 words using succinct phrases. Include prerequisites, limitations, lecture/lab hours. Indicate former course number, e.g., (Former Biol 105)

Analysis of energy crisis. Introduction to various forms of energy. Energy conversion processes and environmental effects. Present energy supply and energy projections. Future energy demands and ways of evaluating alternatives.

Enrollment limit per section: 40

Expected number of sections per semester - Year 1 1 **Year 3** 1

Attachments:

1. A statement presenting the ways in which this course meets the Specifications provided in the appropriate section of the General Education Policy as well as in the Policies for Inclusion and Evaluation of General Education Courses.
2. A statement of elements common to all sections of this course, identifying content, objectives, required student activities, grading policy, representative texts, and an approximate schedule for the course. Required student activities include such things as papers, research projects, homework, laboratory and/or studio performance, recitations, participation, attendance, and exams.
3. A typical syllabus for a particular offering of the course.
4. Any special cost factors associated with this course.

Approval for Inclusion in General Education

See original
Department Chair Date

See original
College/School Curriculum Committee Date

See original
College/School Dean Date

Robert D. Merrill 5/2/03
General Education Subcommittee Date

J. Echeverria 5/2/03
Associate Provost Date

Forward Original and TWELVE copies to:
Associate Provost for Academic Affairs, M/S TA 54

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5/9/03

01/10/2001

Attachment 2: Statement of Common Elements for PSci 168

PSci 168 Energy and the Environment

Class objectives:

(1) To serve as a conceptual physics course, with special emphasis on the physics of energy, energy generation, and energy use, and their effects on the environment.

(2) To run the course as a seminar, encouraging student participation.

(3) To promote student understanding of scientific method, emphasizing how we know what we know, and what we don't know.

(4) To practice critical thinking and reasoning skills, useful both in and outside of science.

(5) To provide experience with quantitative reasoning and graphics, again useful both in and outside of science.

Mathematics: This course will require the use of some algebra and basic geometry, but mainly a lot of arithmetic. We will also use scientific notation, units conversions, and proportions.

Representative Course Text: Energy: Its Use and the Environment, 3rd edition (2002), by Roger A. Hinrichs

Course grades will be assigned for the following total percentages:

90-100% = A; 80-89% = B; 70-79% = C; 60-69% = D; 0-59% = F.

All assignments must be completed. These total percentages will be computed from the following weights:

2 Midterm Exams:	30% (15% each)
Homework and projects:	20%
Paper titles and summaries:	5%
2200-word paper, due on the last day of instruction:	20%
Final Exam:	25%

General Class Schedule for PSci 168 Energy and the Environment:

Week	M	W	**Chapters from Energy, by R. A. Hinrichs, to read by Monday of next week**
1	Introduction	Chapter 1: Introduction	Chapter 1 and the entire syllabus
2	Ch. 1: The mathematics of exponential growth	Ch. 2: Energy Mechanics	Chapters 2 and 3
3	Ch. 2: Energy Mechanics, units conversions, and Ch. 3: Conservation of Energy	Ch. 3: Conservation of Energy	Chapter 4
4	Ch. 4: Heat and Work	Ch. 4: Heat and Work	Chapter 5
5	Ch. 4: Heat and Work: examples	Ch. 5: Home-Energy Conservation and Heat-Transfer Control	Re-read Chapters 1-4
6	Review	**Mid-Term Exam 1** (covering Chapters 1-4)	Chapter 6
7	Ch. 6 Solar Energy: Characteristics and Heating	Ch. 6 Solar Energy: Characteristics and Heating	Chapters 7 and 8
8	Chapter 7: Fossil Fuels	Chapter 8: Air pollution	Chapters 9 and 10
9	Chapter 9: Global Warming	Chapter 10: Electricity	Chapter 11
10	Chapter 10: Electricity	Chapter 11: Electromagnetism and generators	Re-read Chapters 5-9
11	Review	**Mid-term Exam 2** (covering Chapters 5-9)	Chapter 11
12	Presentation on Hybrid-electric Saturn car; exam review	Chapter 11: Electromagnetism and generators; **Paper titles and summaries due** (150-250 words)	Chapters 12 and 13
13	Chapter 12: Electricity from Solar Energy	Chapter 13: The Atom and the nucleus	Chapter 14 and 15
14	Chapter 14: Nuclear Fission	Chapter 15: Radiation health	Chapters 16 and 17
15	Chapter 16: Fusion energy	Chapter 17: Biomass energy	Chapter 18; Re-read Chapters 1-17
16	Chapter 18: Geothermal energy	Review; **Paper due** (2200 words)	Re-read Chapters 1-18

Course Topics: PSci 168 Energy and the Environment

A timely analysis of the energy crisis. Introduction to various forms of energy, conversion processes, and environmental effects. Present energy supply and energy projections. Future energy demands and ways of evaluating alternatives. Specific topics covered include:

1. Introduction
Energy: An Initial Definition
Energy Use and the Environment
Energy Use Patterns and Resources
Exponential growth and
Resource Depletion
Oil: A Critical Resource
Energy Conservation
Economic and Environmental
Considerations
Future Scenarios

2. Energy Mechanics
Forms of Energy and Energy Conversion
Newton's Laws of Motion
Energy and Work
Power
Kinetic and Potential Energy

3. Conservation of Energy
The Principle of Conservation of Energy
Energy Conversion Efficiencies
Energy Use in Developing Countries
Energy Units

4. Heat and Work
The First Law of Thermodynamics:
Temperature and Heat
Heat Transfer Principles
Heat Engines
The Second Law of Thermodynamics

5. Home-Energy Conservation and Heat-Transfer Control
Building Materials
House Insulation and Heating
Calculations
Site Selection
Energy Conservation
Cooling
Air Conditioners and Heat Pumps

6. Solar Energy: Characteristics and Heating
Characteristics of Incident Solar
Radiation
History of Solar Heating
Solar Heating Today
Solar Domestic Hot Water (DHW)
Solar Water Heater Performance
Passive Solar Space Heating Systems
Active Solar Space Heating Systems
Thermal Energy Storage

7. Fossil Fuels
Resource Terminology
Oil
Pipeline Politics and the Former Soviet
Union
Oil Spills
Natural Gas
Coal: an Expanding Role
Future Sources of Oil

8. Air pollution and Energy Use
Properties and Motion of the
Atmosphere
Air Pollutants and Their Sources
Air Quality Standards
Automobile Emission Control Devices
Mass Transit
Stationary Source Air Pollution Systems

9. Global Warming, Ozone Depletion, and Waste Heat
Global Warming and the Greenhouse
Effect
Carbon Taxes

Ozone Depletion
Thermal Pollution
Cooling Towers and Ponds
Using Waste Heat

10. Electricity: Circuits and Superconductors
Restructuring of the Electric Utility Industry
Managing Energy Demand
Electrical Charges and Currents
Batteries and Electric Vehicles
Hybrid-Electric Cars
Ohm's Law
Superconductivity
Elementary Circuits
Electrical Power
Pricing Electrical Energy Use
Fuel Cells

11. Electromagnetism and Generators
Magnetism
The Generation of Electricity
Transmission of Electrical Energy
Standard Steam-Electric Generating Plant Cycle
Cogeneration

12. Electricity from Solar, Wind, and Hydro Energy
Solar Cell Principles
Cell Manufacture
Photovoltaic Systems and Economics
Wind Energy
Hydropower
Small-Scale Hydroelectric Systems
Solar Thermal Electric Facilities

13. The Building Blocks of Matter: The Atom and the Nucleus
The Atomic Hypothesis
Building Blocks of the Atom
Energy Levels
Nuclear Structure
Radioactivity
Nuclear Binding Energy
Nuclear Reactions and Fission

14. Nuclear Power: Fission
Chain Reactions
Assembling a Nuclear Reactor
Types of Light Water Reactors
The Nuclear Fuel Cycle
Radioactive Wastes
Decommissioning
Radioactive Releases
Probabilistic Risk Assessment and Nuclear Safety
Alternate Reactor Designs
Breeder Reactors
Nuclear Proliferation
Post-Cold War Proliferation

15. Radiation Health
Radiation Dose
Biological Effects of Radiation
Background Radiation, including Radon
Radiation Standards
Medical and Industrial Uses of Radiation
Food Irradiation
Radiation Protection

16. Future Energy Alternatives: Fusion
Fusion: Energy from the Stars
Conditions for Fusion
Magnetic Confinement Fusion
Laser-Induced Fusion
Cold Fusion
The Outlook for Fusion

17. Biomass Energy
Municipal Solid Waste
Brazil's Ethanol Program
Wood Combustion
Energy Plantations

18. Geothermal energy
Origin and Nature of Geothermal Energy
Hydrothermal Systems
Geothermal Exploration and Resources
Environmental Impact

Attachment 3: Typical Syllabus for PSci 168

(available online at http://zimmer.csufresno.edu/~fringwal/ps168s01syl.html)

PSci 168 Environmental Impact of Energy Demands by Society - 2001 Spring

Course syllabus: please read carefully.

Instructor: Dr. Ringwald
E-mail: **frederick_ringwald@csufresno.edu**
Phone: 278-8426
Also: 278-2371 (secretary)

Office hours: MWF 1-1:50, MW 4:30-5:20, and by appointment.
Office: McLane Hall, Room 011, in the new Building J (or "J-wing").
This is across the outdoor "hall" from McLane 149 and 151.

You **don't** need an appointment to come in during office hours. This is time set aside for you, when I will be in.

Please feel free to contact me, if you have any problems whatsoever in this course: or if you're doing well, and just want to talk about energy and the environment. It's in our interest, and it matters to me, that you do well!

Course Description (from the CSUF *2000-2001 General Catalog):* (3 credits). Analysis of energy crisis. Introduction to various forms of energy, energy conversion processes and environmental effects. Present energy supply and energy projections. Future energy demands and ways of evaluating alternatives.

Class objectives: (1) To serve as a conceptual physics course, with special emphasis on the physics of energy, energy generation, and energy use, and their effects on the environment. (2) To run the course as a seminar, encouraging student participation. (3) To promote student understanding of scientific method, emphasizing how we know what we know, and what we don't know. (4) To practice critical thinking and reasoning skills, useful both in and outside of science. (5) To provide experience with quantitative reasoning and graphics, again useful both in and outside of science.

Mathematics: This course will require the use of some algebra and basic geometry, but mainly a lot of arithmetic. We will also use scientific notation, units conversions, and proportions.

Course meeting times and location: Schedule 27193 (section 1): MW 3-4:15 p.m., in McLane 280.

Holiday: February 19 (Presidents Day)

Required Course Text: Energy: Its Use and the Environment, 2nd edition (1996), by Roger A. Hinrichs
It should be available at the campus Bookstore, in the University Student Union building.

Required Course Equipment: (1) Clear plastic ruler; (2) Scientific calculator (that has scientific notation, and can calculate logarithmic and exponential functions)

Course web page: http://zimmer.csufresno.edu/~fringwal/ps168.html

Course grades will be assigned for the following total percentages:

90-100% = A; 80-89% = B; 70-79% = C; 60-69% = D; 0-59% = F.

All assignments must be completed. These total percentages will be computed from the following weights:

• 2 Midterm Exams:	30% (15% each)
• Homework and projects (please note: no late assignments can be accepted):	20%
• Paper titles and summaries, two copies of which are due Wednesday, April 25:	5%
• 4000-word paper, two copies of which are due on the last day of instruction for this class, on Wednesday, May 16:	20%
• Final Exam, which will be comprehensive (covering all material in the entire course), which will be Monday, May 21, 3:30-5:30 in the regular classroom:	25%

Please note:

• **Attendance**: **All students are expected to attend all class sessions.** All students are also expected to arrive for class on time, and to attend to the end of all class sessions. If you must miss a lecture for a compelling reason (e.g. job interview or illness documented by a doctor's note), then get the notes from another student.

• **Keep up with the reading assignments, throughout the semester.** Class time is valuable: it is much better spent in informed, active discussion among all of us than in just me talking. It amazes me: the students who get "A"s are almost always the ones who keep up with the reading. The ones who don't, almost always are the ones who don't.

• **Don't be shy about asking questions** in class, or during office hours. Remember that the only "dumb" question is the one you didn't ask, that fouled you up later because you didn't ask it. This is especially so in this class, which I want to run as a seminar.

• All students are required to **turn off all beepers, pagers, and portable phones** while class lectures are in session, because they are so disruptive.

• I often use e-mail to communicate with students, and please feel free to send e-mail to me. However, **all assignments must be handed in as paper copies**, including homework, projects, paper titles and summaries, and papers.

• **NO late assignments can be accepted,** including homework, lab assignments, paper summaries, papers, or any other assignments.

• **All students are required to hang on to all class materials for the duration of the class.** Hang onto all copies of all work you have done in all your classes, ever. Hang on to your textbooks, too: even the real stinkers can serve as bad examples.

• The Department of Physics cooperates with the Services for Students with Disabilities (SSD) to make reasonable accommodations for qualified students with physical, perceptual, or learning disabilities (cf. Americans with Disabilities Act and Section of 504, Rehabilitation Act). Present your written accomodation request to Dr. Ringwald within the first two weeks of class.

• I plan to use the World Wide Web in this course. I will require you to know how to use an Internet browser and how to use e-mail. Most students will already know this, but if you don't, don't be embarrassed. Please let me know: I'd be glad to give you private lessons during my office hours. Although it would be a big advantage for your schoolwork, you need not own a computer, since you may use the computers at many labs around campus.

• **Exams:** There will be two midterm exams during the semester and a comprehensive final exam. The material for these exams will come from the lectures and assigned reading. **All exams will be closed book** and as such you may not use any notes or books during the exam. Calculators may be used for the exams.

Sorry, but **I do *not* give make-ups for midterm exams.** I can never be sure that a makeup was really fair, since it must be different from the regular exam. If you should have to miss a midterm exam for a compelling reason (e.g. job interview or illness documented by a doctor's note), I will void the part of the course grade that midterm would have counted and count the rest of the grade as 100%.

• **Research Papers**: Writing is a key skill for everyone. No scientific investigation is complete until it becomes known to the world. Scientists usually do this by writing papers and publishing them. Too many scientific discoveries have been ignored because the scientists did not do a good job of writing up the results, in ways that people could

understand. I will therefore assign a **4000-word paper**, due on the last day of instruction, **Wednesday, May 16**. Since I take this so seriously, I personally read and grade every one!

These papers may be on any topic on current, historical, or future concerns about energy, energy generation, energy use, any of their effects on the environment, or related science or technology. A typed (or computer printed) **paper title and short summary (between 100 and 250 words) is due on Wednesday, April 25.**

These papers must provide a list of references, or works cited. Not having this can turn an "A" paper into a "B" paper. There must be at least five references. No more than two of these five can web addresses. You may use more references than this required minimum: indeed, if you want an A, you should have substantially more.

- **I will allow students to collaborate with each other on homework and projects**, provided everyone lists their "co-investigators" on their papers. Scientists often do this, and the ability to collaborate well and work as part of a team is a good skill to have, in science and in other professions.

However, if you do collaborate, it must be genuine collaboration: *not* one person doing all the work, and the others copying. That's cheating! Therefore, while you may work together, write up the results separately, in your own words. A dead giveaway is when I get two papers that are exactly the same. Do people think I don't notice?

- **Plagiarism**: I like even less when students take papers from the Internet, and turn them in as their own work, which constitutes plagiarism. This is now easy for professors to detect, with www.plagiarism.org. Modifying someone else's paper slightly, or changing the words around, or stringing someone else's paragraphs together, even if they're cited, is no better: these dubious practices still don't make it your paper. For information on the University's policy regarding cheating and plagiarism, refer to the *Schedule of Courses* (Legal Notices on Cheating and Plagiarism) or the *University Catalog* (Policies and Regulations).

To prevent plagiarism, **two copies** of both the paper titles and summaries and the papers themselves are due, on the appropriate dates (April 25 for the titles and summaries, and May 16 for the papers). **I must have two copies, or the paper (or summary) gets an F.** I will keep one of the copies of these papers and summaries on file, for life. If I find a plagiarized paper, I will send it to the Dean and recommend the student be expelled—or the degree be revoked, if I don't find it until 25 years from now.

- This syllabus is subject to change in the event of extenuating circumstances. If you are absent from class, it is your responsibility to check on announcements made while you were absent.