

LSC Use Only
Number: 132
Action: _____
Date: _____

UWUCC Use Only
Number: _____
Action: _____
Date: _____

CURRICULUM PROPOSAL COVER SHEET
University-Wide Undergraduate Curriculum Committee

I. Title/Author of Change

Course/Program Title: px 101 ~~Physics~~ ^{Energy} and our Environment
Suggested 20 Character Course Title: ~~Physics~~ & Environment
Department: Physics ^{Energy}
Contact Person: Dr. Kenneth Hershman / Mr. Richard Roberts

II. If a course, is it being Proposed for:

_____ Course Revision/Approval Only
_____ Course Revision/Approval and Liberal Studies Approval
X Liberal Studies Approval Only (course previously has been approved by the University Senate)
X Title Change / Course Description Change

III. Approvals

Richard B. Roberts Department Curriculum Committee
John H. Fox Department Chairperson
Miss Han College Curriculum Committee
W. J. Cole College Dean *
Charles D. ... Director of Liberal Studies (where applicable)
Provost (where applicable)

*College Dean must consult with Provost before approving curriculum changes. Approval by College Dean indicates that the proposed change is consistent with long range planning documents, that all requests for resources made as part of the proposal can be met, and that the proposal has the support of the university administration.

IV. Timetable

Date Submitted to LSC: _____
to UWUCC: _____

Semester to be implemented: Summer, 1990

Date to be published in Catalog: 1991 - ?

Date: April 30, 1990
Subject: PY 101 Energy and the Environment
To: Liberal Studies Committee
From: John Fox, Kenneth Hershman and Richard Roberts

In response to your inquiry:

- a) The question of a "book length" reading is addressed as follows.

The text, "*Energy and Problems of a Technical Society*" is a non-traditional text that addresses a number of issues concerning energy, its sources, the limitation of those sources, the dangers from the use of these sources, conservation, pollution, etc. In addition, students will be required to read portions of "*The Limits to Growth*." This book discusses a computer model for the use of energy and what various scenarios can arise in the future. Finally, as part of their writing assignment, students will be required to read articles from various journals such as Scientific American, Discovery, etc.

- b) The impact of energy issues upon various cultures will surely be discussed. For example, how does our need for energy to maintain our standard of living impact upon third world nations? How do scientists view the need of nuclear energy and do they consider the issues of plant placement? How will the new high temperature superconductors impact upon, for example, the plains Indian? What issues must be considered in discussing nuclear waste disposal? These issues and others should all arise in the natural discussion of the topics covered in this course. Our intent here is to create a citizen who is capable of looking at an issue from many aspects, who can understand the diverse thinking of the various disciplines about a particular issue, and who has the ability to coalesce that thinking into an informed opinion.
- c) Surely "Scientific inquiry" at some level will be a goal of this course. By the very nature of the course, a student will be able to follow the logic of a scientist as he or she approaches a problem. Problem solving will be at an elementary level and since this is not a laboratory course, there will be no hands-on experience for the students. The students will, however, see data laid out before them for discussion of and in support of various arguments.

LIBERAL STUDIES COURSE APPROVAL

Part I. Basic Information

- A. We are proposing PY 101 for the Natural Science non-laboratory and the Liberal Studies Elective categories.
- B. We are requesting regular approval for this course.
- C. During the transition from General Education to Liberal Studies, PY 101 should be listed as an elective course. It does not fulfill any General Education requirement.

Part II. Which Liberal Studies goals will your course meet?

A. Intellectual skills and modes of thinking:

- 1. Primary goal. Inquiry, abstract logical thinking, synthesis, decision making and other aspects of the critical thinking process.

In the process of forming intelligent and rational positions on environmental issues, it is necessary that students

- a. make inquiry into the nature of these issues to build a knowledge base.
 - b. make logical conclusions from the synthesis of data and physical relationships.
 - c. ascertain the effects of present trends in energy consumption and its effect on the quality of life.
 - d. make decisions about personal action toward desirable quality of life.
- 2. A primary goal of PY 101 will be to enhance the scientific literacy of the students. They will be expected:
 - a. to read reports, articles in popular science periodicals, etc. involving technology/environmental issues.
 - b. to write critical analysis of their readings.
 - c. to give oral reports on their readings.
 - d. to review popular video tape presentations and find/report dissenting views.
 - e. to form their own personal views on the issues and/or defend a particular position in an oral discussion group.
 - 3. Secondary goal. Understanding numerical data. The students will be expected to make basic calculations involved in energy production, risk analysis and depletion projections.
 - 4. Secondary goal. Historical consciousness. The past century in science and technology has contributed to the present state of the environment. Raising awareness of this history will be part of the analysis of the present situation. It will also be used to form personal opinions about possible solutions.

5. **Primary goal. Scientific inquiry.** This course, taught by a physicist, will enable the student to follow the thought processes of a scientist as he attacks a problem. Although there will be no hands-on data collection, the reasons for collecting data, the methods used, the analysis of data, and the position taken as a result of that analysis will all be part of this course.

6. **Secondary goal. Values.** To form opinions on particular courses of action on environmental issues, a set of values will be developed by the class.

B. **Acquiring a body of knowledge or understanding essential to an educated person:**

To gain an understanding of major trends in science and technology as they pertain to environmental issues. Activities include, for example, studying how electric power is generated and transmitted to our homes and converted to other forms of energy and the environmental effects thereof.

D. **Certain collateral skills:**

1. **Use of the library**

The students will make use of:

1. NOVA / DISCOVERY, etc. video tape presentations
2. Periodicals: Science, Scientific American, Technology Review and environmental periodicals to gather information for analysis.

Part III. Does your course meet the general criteria for liberal studies?

A. **The physics department will use the following strategy to achieve basic equivalency:**

At present there is only one section of this course. If more than one section of this course is offered in the future then the following statements will be true. All sections will be guided by the same objectives as listed in the syllabus of record. Technology and its environmental impact is in a state of flux and, therefore, the topical content listed in the syllabus of record is subject to change. However, the process of making journal searches, developing informed positions and presenting them to others will be required in all sections of the course.

B. **There have been few well-known contributors to the field of physics who are women, ethnic or racial minorities. There have been more such contributors in the relatively new field of environmental studies, but they are not widely recognized. Students will read and report on articles written by or about female or minority scientists. A partial list of minority authors/scientists who will be presented in PY 101 includes:**

Marie Curie - Nuclear Physics
Rachael Carson - "Silent Spring"
H. Meadows - "Limits to Growth"
Maria Telkes - Solar Energy
Sandra Postel - "World Watch"

Broader issues of race and gender will also be brought into discussions. Particular attention will be placed upon Third World Nations and the impact of

our use of energy on these societies. Questions of the future concerning placement of remote energy sources and the impact of that placement upon small isolated communities will be discussed. Questions of how energy and its use can affect groups of individuals will be given attention.

- C. Students are expected to write two position papers on an environmental issue or issues of their choice utilizing a minimum of three approved science journals.

In addition they will write three journal reports critically analyzing the author's position and expressing their own logically developed position on the environmental issue in question.

Finally, they are required to write an analysis of a real or hypothetical environmental situation to discern the major factors involved. They will be asked to project the environmental effects if the scenario is allowed to proceed unchecked over time, and finally to develop a plan of action whereby they might achieve an outcome which is acceptable to them.

- D. This course is different from what is provided for beginning majors in that neither calculus nor trigonometry is used in this course. PY 101 is elected by all of the students who take this course to fulfill the Natural Science requirement of the University. Selected subject areas in physics are studied in this course. Some of the more recent discoveries in physics are discussed with attention being given to the implications of these discoveries to the future of the students seated in that classroom.

- E. Our courses will contribute to the Liberal Studies Criteria as follows:

Through exposure to the environmental issues, it is our goal to raise interest in the issues and make known the goals and desires of the parties involved.

2. Define and analyze problems, frame questions, evaluate available solutions and make choices on environmental issues.
3. Students will communicate knowledge and exchange ideas on environmental issues by writing papers, reports and analyses, and by making oral reports and participating in group discussions on environmental issues.
5. Continue learning even after the completion of their formal education -- Students will learn the language and concepts necessary to make knowledgeable judgements required of laymen in a technologically-oriented society, e.g., to have the basic knowledge to understand the arguments concerning the needs for and dangers of nuclear energy.

Part IV. Does your course meet the criteria for the curriculum category in which it is to be listed.

Yes -- See enclosed course syllabi.

Physics and our Environment

- I. An overview of the areas of energy, transportation and pollution. These topics are approached via the relevant concepts of physical science and physics. 3c - 01 - 3sh
- II. **Course Objectives**
1. To gain a knowledge of environmental issues.
 2. To gain an understanding of the principles and concepts of physics involved in environmental issues.
 3. To identify the needs of society which contribute to environmental issues.
 4. To write critical reports (and make oral presentations) on environmental issues, episodes and accidents.
 5. To make educated projections on the outcome of environmental issues under various assumed scenarios.
 6. To study expert projections of environmental outcomes made in the recent past and compare them with present day reality to determine events/factors which have affected the outcomes.
- III. **Suggested Course Outline and Approximate Class Time Allotment**
- A. Energy Fundamentals (3 hours)
1. Basic Concepts
 2. Forms of Energy
 3. Energy Consumption
- B. Energy from Fossil Fuels (5 hours)
1. Sources / Production / Technology
 - a. Petroleum
 - b. Natural gas
 - c. Coal
 2. Marginal Sources
 3. Environmental Issues Concerning Production
- C. Energy Conversion (2 hours)
1. Efficiency
 2. Thermodynamics of Engines
 3. Electricity
 4. Efficiencies of Coal Fired and Nuclear Power Plants
 5. Cogeneration
- D. Nuclear Energy (5 hours)
1. Basic Physics of Nuclear Energy
 2. Structure of Nuclear Power Plants
 3. Types of Reactors

- E. Environmental Issues / Safety (5 hours)
 - 1. Radioactivity / Health Science
 - 2. TMI
 - 3. Chernobyl
 - 4. Waste Storage
 - 5. Coal Fired Power Plants
 - 6. Relative Risks

- F. Alternative Energy Sources (5 hours)
 - 1. Solar
 - a. domestic applications
 - b. large systems / electricity
 - 2. Hydroelectric
 - 3. Wind
 - 4. Ocean / Tides
 - 5. Geothermal
 - 6. Storage of Energy

- G. Energy Conservation (4 hours)
 - 1. Space Heating / Insulation
 - 2. Efficiency of Appliances
 - 3. Waste Heat Recovery
 - 4. Recycling / Waste Disposal / Incineration

- H. Plant and Food Production (2 hours)
 - 1. Photosynthesis
 - 2. Feeding the World's Population
 - 3. Fuel from Biomass

- I. Transportation (4 hours)
 - 1. System Needs: fuels, people, freight
 - 2. System Efficiencies: routing, mass transit
 - 3. Trucking, Railroads and Air Transport

- J. Production of Air/Water Pollutants and Their Effects (4 hours)
 - 1. Carbon Monoxide
 - 2. Nitrous Oxides
 - 3. Photochemical Smog
 - 4. Sulfur Dioxide
 - 5. Carbon Dioxide
 - 6. Global Warming

IV. Evaluation Methods

The course grade will be determined by the following evaluation instruments and weightings.

- | | |
|-------------------------------|-----|
| 1. Scenario Analysis (1) | 20% |
| 2. Article reports (3) | 30% |
| 3. Papers with References (2) | 50% |

Grades will be awarded on the basis of:

89%.....	A
78%.....	B
67%.....	C
56%.....	D

V. **Current Text**

Kraushaar, J.J. & Ristinen, R.A.

Energy and Problems of a Technological Society

Revised edition, 1988, Wiley

Required reading

D. H. Meadows, D. L. Meadows, J. Randers, and W. Behrens

The Limits to Growth

Universe Books, 1972