

PHYS 101 Energy and Our Environment – Modification to meet the new Liberal Studies curriculum

LSC Use Only Proposal No: _____ UWUCC Use Only Proposal No: 12-29a
 LSC Action-Date: APP-4/25/13 UWUCC Action-Date: APP-5/7/13 Senate Action Date: APP-9/10/13

Curriculum Proposal Cover Sheet - University-Wide Undergraduate Curriculum Committee

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Proposing Department/Unit Physics	Phone 7-4590 or 7-2370

Check all appropriate lines and complete all information. Use a separate cover sheet for each course proposal and/or program proposal.

1. Course Proposals (check all that apply)

New Course Course Prefix Change Course Deletion
 Course Revision Course Number and/or Title Change Catalog Description Change

Current course prefix, number and full title: PHYS 101 Energy and Our Environment

Proposed course prefix, number and full title, if changing:

2. Liberal Studies Course Designations, as appropriate

This course is also proposed as a Liberal Studies Course (please mark the appropriate categories below)

Learning Skills Knowledge Area Global and Multicultural Awareness Writing Intensive (include W cover sheet)
 Liberal Studies Elective (please mark the designation(s) that applies – must meet at least one)
 Global Citizenship Information Literacy Oral Communication
 Quantitative Reasoning Scientific Literacy Technological Literacy

3. Other Designations, as appropriate

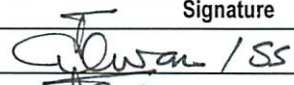


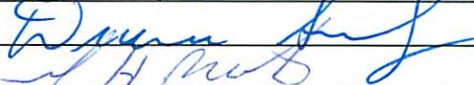
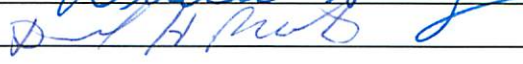

Honors College Course Other: (e.g. Women's Studies, Pan African)

4. Program Proposals

Catalog Description Change Program Revision Program Title Change New Track
 New Degree Program New Minor Program Liberal Studies Requirement Changes Other

Current program name:

Proposed program name, if changing:

5. Approvals	Signature	Date
Department Curriculum Committee Chair(s)		4-23-2012
Department Chairperson(s)		4-23-2012
College Curriculum Committee Chair		4-23-12
College Dean		4/23/12
Director of Liberal Studies (as needed)		5/2/13
Director of Honors College (as needed)		
Provost (as needed)		
Additional signature (with title) as appropriate		
UWUCC Co-Chairs		5/7/13





I. CATALOG DESCRIPTION

PHYS 101 Energy and Our Environment

3c-01-3cr

An overview of the areas of energy, transportation, and pollution. These topics are approached via the relevant concepts of physical science and physics. A non-laboratory course for Liberal Studies requirements.

Course Syllabus

II. COURSE OBJECTIVES

Students will:

Objective 1:

Discuss issues associated with specific energy sources and their effect on the environment.

EUSLO 1:

Informed Learners

Rationale:

Review of articles as well as homework assignments will highlight important environmental issues. Students will describe these issues in written reviews as well as written homework assignments. Students will demonstrate knowledge and understanding of the interrelationships within and across disciplines in the field of energy. Knowledge of energy use and production makes a learner informed.

Objective 2:

Relate physics concepts to environmental issues

EUSLO 1 and 2:

Informed Learners and Empowered Learners

Rationale:

Assignments will require students to use the principles and concepts of physics to estimate the relative future feasibility of traditional as well as novel energy sources. The student will also apply physics principles to energy issues in the final paper. The ability to discourse on energy empowers the learner in dealing with current energy issues.

Objective 3:

Identify how the needs of society contribute to environmental issues.

EUSLO 1 and 2:

Informed Learners and Empowered Learners

Rationale:

The topic for the final paper for the class will be selected by the students. This selection process will require the student to consider energy needs balanced with environmental factors. Learners are invested in future of energy; this objective will emphasize the place of energy in society.

Objective 4:

Discuss current environmental issues.

EUSLO 1, 2 and 3:

Informed Learners, Empowered Learners, and Responsible Learners

Rationale:

Article reviews and the final paper will satisfy this requirement. There are alternative concepts on some environmental issues held by some of the students. Critical analysis of environmental and energy needs will focus attention on these alternative conceptions.

Objective 5:

Discuss the possible environmental conditions that would arise from various scenarios.

EUSLO 2 and 3:

Empowered Learners and Responsible Learners

Rationale:

The articles that are to be reviewed will address the issues of non-renewable as well as renewable resources. In making a prediction about future energy supplies; students need to understand the relationship of energy consumption to energy sources. Making predictions is an enabling activity for future energy decisions.

Objective 6:

Compare and contrast current and past environmental projection outcomes and the events/factors that have affected them.

EUSLO 2 and 3:

Empowered Learners and Responsible Learners

Rationale:

The selected text book has sections where the predictions made in the past are discussed. When the prediction did not come to fruition, an explanation is given as to why this was the case. Students will also write reviews that predict life cycles of various energy sources. In making a prediction about future energy supplies; students need to understand the responsibility of energy consumption in relation to energy sources. Students will demonstrate knowledge and understanding of the interrelationships within and across disciplines.

III. COURSE OUTLINE

- A. Energy Fundamentals (5 hours)
 - 1. Basic concepts
 - 2. Forms of energy
 - 3. Energy consumption
- B. Energy from fossil fuels (4 hours)
 - 1. Sources / Production/ Technology
 - a. Petroleum
 - b. Natural gas
 - c. Coal
 - 2. Marginal sources
 - 3. Environmental issues concerning Production
- C. Energy Conversion (5 hours)
 - 1. Efficiency
 - 2. Laws of energy conversion
 - 3. Electricity
 - 4. Efficiencies of coal fired and nuclear power plants
 - 5. Cogeneration
- D. Nuclear Energy (4 hours)
 - 1. Basic physics of nuclear energy
 - 2. Structure of nuclear Power Plants
 - 3. Types of reactors
- E. Environmental Issues / Safety (4 hours)
 - 1. Radioactivity / health science
 - 2. TMI
 - 3. Chernobyl

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- 4. Waste Storage
- 5. Coal fired power plants
- 6. Relative Risks
- F. Alternate Energy Sources (4 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 Usage (4 hours)
 - 1. Space heating / Insulation
 - 2. Efficiency of appliances
 - 3. Waste heat recovery
 - 4. Recycling / Waste disposal/Incineration
- H. Plant and Food Production (4 hours)
 - 1. Photosynthesis
 - 2. Feeding the world's population
 - 3. Fuel from Biomass
- I. Transportation (4 hours)
 - 1. System needs: fuels, people, and freight
 - 2. System efficiencies: routing, mass transit
 - 3. Trucking, railroads, and air transport
- J. Production of Land, Air, and Water pollutants and their Effect (4 hours)
 - 1. Carbon Monoxide
 - 2. Nitrous oxide
 - 3. Photochemical smog
 - 4. Sulfur dioxide
 - 5. Carbon dioxide
 - 6. Global warming

Terminating activity - paper submission and review (2 hours)

IV. EVALUATION METHODS

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

1. Article reports (4)*	30%
2. Paper with references	20%
3. Discussions §	20%
4. Homework problems	30%

** One report will meet Liberal Studies requirement of non-text book reading.*

§ Discussion grade will depend upon the contribution of the student in small group work, each member of the group will be assigned a task or problem to complete in the group – the written solution to the problem will be collected.

V. GRADING SCALE

A: $\geq 90\%$ B: 80-89% C: 70-79% D: 60-69% F: $<60\%$

VI. ATTENDANCE POLICY

Course attendance policy will be consistent with the Undergraduate Attendance Policy in the IUP Undergraduate Catalog.

VII. REQUIRED TEXTBOOKS, SUPPLEMENTAL BOOKS AND READINGS

Text Book

Energy: Its Use and the Environment, 5th Edition, Roger A. Hinrichs - State University of New York, Oswego Merlin H. Kleinbach - State University of New York, Oswego ISBN-10: 0495010855 ISBN-13: 9780495010852 72 Pages Paperback ©2012

Supplemental Readings

“Nuclear Power: A Panacea for Future Energy Needs Environment”, *Environment*, Volume 52 Number 2 March/April 2010

“Peak Oil” *Bulletin of the Atomic Scientists*, November/December 2008

VIII. SPECIAL RESOURCES

None noted

IX . BIBLIOGRAPHY

Bishop, Amanda, Cavendish, Marshall *Energy Conservation (Saving Our World)*, Tarrytown, NY Benchmark, (2009)

Bosselman, Fred, Eisen, Joel B., Rossi Jim, Spence, David B., *Energy, Economics and the Environment*, 3d (University Casebook) (2010) Foundation Press

Brown, Lester R, *Plan B 4.0 Mobilizing to save Civilization*, New York W,W, Norton, 2009

Coyle, Eugene D. and Dark, Melissa J. *Understanding the Global Energy Crisis* by (2014) Purdue University Press

Lang, John and Leitman,Seth *Solar Energy DeMYSTiFied* by (2014)

Muller, Richard A. *Energy for Future Presidents: The Science Behind the Headlines* W. W. Norton & Company (2013)

Riley, Peter, *Forces and Movements*, London Franklin Watts, (2008)

Troy, Austin *The Very Hungry City: Urban Energy Efficiency and the Economic Fate of Cities* (2014)
Yale University Press

Wolfson Richard, *Energy, Environment, and Climate* (2011) W. W. Norton & Company

Overview of changes from original syllabus of record – updating to new curriculum

The only significant change for this class is rewriting the objectives to be student centered and mapping of course objectives with the Expected Undergraduate Student Learning Outcomes (EUSLO).

OLD SYLLABUS

PHYS 101 Energy and Our Environment

3c-01-3cr

An overview of the areas of energy, transportation, and pollution. These topics are approached via the relevant concepts of physical science and physics. This is a non-laboratory course for Liberal Studies requirements.

Course Syllabus

II. Course Objectives

1. To explain a set of environmental issues
3. To be able to identify the needs of society which contribute to environmental issues.
4. To write critical reports environmental issues.
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.

Sample Assignment with scoring rubric

Download and read the four articles – “Easy Solar Power”, “Energy from the Sea”, “The Sunshine Solution”, and, “Turbine Tech”.

- 1) Briefly summarize what each author is stating. What is his or her position on energy resources.
- 2) Summarize the various types of energy sources discussed in this collection of articles. A table might be good for this.

3) There are two basic ways to use solar energy, PV's and capturing solar heat. Briefly describe how they are different. Separately, in table form, compare each of these uses of solar energy.

4) In "Easy Solar Power" the idea of net-metering is mention. Net metering is allowed in Pennsylvania. The idea is, if you generate your own clean, renewable, power at home (solar, wind, geothermal) you can connect your own power system to your electric meter. As you generate your power, you can use what you need, and then if there is extra, you feed that power to the grid. If you are producing more than you are using, your meter runs backward. If you have good month, it is possible that the power utilities would write you a check. What do you predict might happen if many households took advantage of net-metering?

5) For the sake of argument, say it is 2513 A.D. What do you suppose the various energy sources will be then? Consider that in 1513 most of the energy was supplied by bio-mass, so things have changed quite a bit in 500 years. Consider also that most of the fossil fuel will be gone in 500 years. Provide reasons for you answer.

Criteria	3 points	2 points	1 point
Briefly outline what each author is stating.	All articles are described	Only some articles are described	No article description
Summarize the various types of energy sources discussed in this collection of articles.	All energy types are compared.	Some of the energy sources are compared.	No comparison of energy sources
Compare PV to thermal	PV and solar heat are compared in table form	PV and solar heat are not completely compared. No table	No comparison of PV and solar heat.
What do you predict might happen if many households took advantage of net-metering?	Full discussion of net-metering	Incomplete discussion of net-metering	No net meeting discussion.
What do you suppose the various energy sources will be in 2511??	Complete description and discussion.	Prediction but no discussion.	No prediction

Liberal Studies Course Approval Checklist Instruction Sheet

Use this checklist for all Liberal Studies categories other than writing-intensive sections; a different checklist is available for this. If you have questions, contact the Liberal Studies Office, 103 Stabley, telephone 357-5715

This checklist is intended to assist you in developing your course to meet IUP's Criteria for Liberal Studies and to arrange your proposal in a standard order for consideration by the Liberal Studies Committee (LSC) and the University-Wide Undergraduate Curriculum Committee (UWUCC). When you have finished, your proposal will have these parts:

- X Standard UWUCC Course Proposal Cover Sheet, with signatures and Liberal Studies course designation checked
- X Course syllabus in UWUCC format
- NA UWUCC course analysis questionnaire Needed only if this is a new course not previously approved by the University Senate. These are not considered by the LSC but will be forwarded to the UWUCC along with the rest of the proposal after the LSC completes its review

This is not a new course; it has been approved by the University Senate

- X Assignment instructions for one of the major course assignments and a grading rubric or grading criteria for that assignment
- X Answers to the four questions listed in the Liberal Studies Course Approval General Information (one page)

Submit the original of the completed proposal to the Liberal Studies Office (103 Stabley). In addition to the signed hard copy, email the proposal as a Word or RTF file attachment to Liberal-Studies@iupedu

Please Number All Pages

Liberal Studies Course Approval General Information

On a separate sheet of paper, please answer these questions

(Do not include this sheet or copies of the questions in your proposal; submit only the answers)

1) There has been only section of this class offered since its inception, and there will continue to be only one section for the foreseeable future.

2) This class investigates the topics of energy and environment. While minorities and women are not an emphasis of the course, ethnic and racial minorities as well as women are discussed when appropriate. For example in the history of the development of nuclear fission, Lise Meitner was the female scientist who initially developed the fission reaction. Although she did the research, the results were published under the name of her colleague, Otto Hann. A Second illustration is the 1984 Bhopal Disaster as an example of environmental injustice. Most all of the students have heard of the Three Mile Island accident, the Chernobyl accident and the Fukushima accident. The three of these happened in a major western country. However, the Bhopal disaster, where 16,000 Indians died due to the release of methyl-isocyanate is unknown to most of our students, even though there were more deaths at Bhopal than the other three nuclear accidents combined.

3) To meet this requirement, students will read a collection of related articles. There is an assignment to read three research articles, assigned by the instructor from various physics, environmental, or energy industry journals. The students will read the articles and then write a short review. The sample assignment included with this proposal would be typical of how the Liberal Studies assignment will be met.

4) Introductory physics classes cover topics with much more mathematical depth. This class will use much less mathematics than the introductory physics class, PHYS 131. This course also will examine topics in energy production and environmental issues which are not in the syllabus of PHYS 131. The physics content will be similar to that of SCI 105 the physics class for non-science majors, with emphasis on energy and environmental-applications.

Part III letters of support

None are necessary – The objectives of the courses have not changed, the objectives are being mapped to the new Liberal Studies Standards.