

THE UNIVERSITY OF MAINE
NEW COURSE PROPOSAL/MODIFICATION/ELIMINATION FORM
for Undergraduate Courses (9/2011)

DEPARTMENT School of Economics COLLEGE NSFA

COURSE DESIGNATOR ECO PROPOSED COURSE NUMBER 405

COURSE TITLE Sustainable Energy Economics and Policy EFFECTIVE SEMESTER Spring 2013

REQUESTED ACTION NOTE: A complete Syllabus is required for all new courses, including travel-study courses offered through CED or summer session and for the addition of General Education and/or travel-study to an existing course. Please be sure that all elements required for a syllabus at the University of Maine are present. We recommend that you work closely with the syllabus check list bundled with this form.

NEW COURSE (check all that apply and complete Section 1):

- | | |
|--|--|
| <input type="checkbox"/> New Course | <input type="checkbox"/> One-time course w/GenEd |
| <input type="checkbox"/> New Course w/GenEd (Complete Section 2) | <input type="checkbox"/> One-time course |
| <input type="checkbox"/> Experimental | <input type="checkbox"/> Travel Study Course |

ADDITION OF GenEd TO EXISTING COURSE (Complete Section 2):

Addition of GenEd

MODIFICATION (Check all that apply and complete Section 3):

- | | |
|--|---|
| <input type="checkbox"/> Designator Change | <input type="checkbox"/> Cross Listing |
| <input type="checkbox"/> Number Change | <input type="checkbox"/> Travel Study |
| <input type="checkbox"/> Title Change | <input type="checkbox"/> Addition of Electronic Learning Component |
| <input checked="" type="checkbox"/> Description Change | <input type="checkbox"/> Conversion of an existing on site course to an online course |
| <input type="checkbox"/> Prerequisite Change | <input type="checkbox"/> Other (specify) _____ |
| <input type="checkbox"/> Credit Change | |

ELIMINATION (Complete Section 4):

Course Elimination

ENDORSEMENTS (Print name) Sign Initials Date

Leader, Initiating Department/Unit(s)
George Criner gkc 11/5/12

College(s) Curriculum Committee Chair(s)
William Ellis Wge 11/8/12

Dean(s)
ALAN KEZ'S ASK 11/8/12

Associate Provost for Undergraduate Education

Section 2

THIS SECTION MUST BE COMPLETED FOR GENERAL EDUCATION APPROVALS

1) Check all areas for which a course is proposed - Max. 2

- Quantitative Literacy: mathematics, statistics, computer science, formal logic
- Lab Science
- Science Applications
- Western Cultural Tradition
- Artistic & Creative Expression
- Population & Environment
- Social Contexts & Institutions
- Cultural Diversity & International Perspectives
- Writing Intensive
- Capstone Experience
- Ethics

2) For each area proposed, please explain how the course aligns with published criteria for content criteria as found in the "General Education Implementation Guidelines" (1996). For Quantitative Literacy, see the Student Learning Outcomes voted in 2010 by Faculty Senate. All General Education information is kept updated on the UPCC FirstClass conference. Indicate specific elements in the attached syllabus that explain or embody these criteria.

Courses included in the **Population and Environment** sub-category help students to understand how humankind interacts with our finite physical and biological environment. This understanding can be fostered in different ways. Some courses may emphasize technical, scientific problems and solutions. Others may focus on institutional, historical, and political dimensions, and others may focus on the cultural, ethical, and philosophical issues underlying current environmental problems. ECO 405 addresses the following elements of this requirement:

- (1) The role of both local and global environmental change on the quality of human life;
- (2) The influence of historical, cultural, religious, economic, educational and political factors on population growth and environmental quality; and
- (5) Possible sustainable solutions to the population/environment problems.

The following elements of the syllabus (Course Learning Outcomes) embody the above Population and Environment criteria:

4. Compare the social costs and benefits of traditional and alternative energy production, distribution, and use with respect to climate change, other environmental impacts, and human health and well-being
6. Explain what a sustainable energy-environment-economy path is, what makes it sustainable, why there must be transition to it, and what the key features of the transition are expected to look like (including timing)
7. Compare centralized and distributed energy approaches and explain how each might be included in a sustainable energy path
12. Summarize current visions for transitioning to sustainable paths in the U.S., Europe, the world, and locally
13. Synthesize a vision for transitioning to a sustainable energy future

This course specifically focuses on the impacts to human health and the environment from the status quo of energy production, distribution and use; the tradeoffs associated with alternatives to the status quo; and alternative paradigms to developing an economically, environmentally and socially sustainable energy future.

Quantitative literacy is the ability to formulate, evaluate, and communicate conclusions and inferences from quantitative information. Students will develop their quantitative literacy during their undergraduate experience through courses targeted at quantitative literacy and through frequent exposure to quantitative problems and

analyses both inside and outside of their major. ECO 405 addresses the following elements of this requirement:

1. Translate problems from everyday spoken and written language to appropriate quantitative questions.
2. Interpret quantitative information from formulas, graphs, tables, schematics, simulations, and visualizations, and draw inferences from that information.
3. Solve problems using arithmetical, algebraic, geometrical, statistical, or computational methods.
4. Analyze answers to quantitative problems in order to determine reasonableness. Suggest alternative approaches if necessary.
5. Represent quantitative information symbolically, visually, and numerically.
6. Present quantitative results in context using everyday spoken and written language as well as using formulas, graphs, tables, schematics, simulations, and visualizations.

The following elements of the syllabus (Course Learning Outcomes) embody the above Quantitative Literacy criteria:

1. Distinguish between concepts of power and energy and convert between power and energy units across a wide range of energy resources, technologies and uses.
2. Analyze data from the U.S. Energy Information Administration, International Energy Agency, and other resources in order to describe the total amount of energy used in the U.S. and world economies over time, the trends in energy intensity, the trends in energy prices, and the trends in TAE shares
3. Identify the key traditional and alternative energy resources and technologies and describe their development costs, production structure, market characteristics, and special issues
4. Compare the social costs and benefits of traditional and alternative energy production, distribution, and use with respect to climate change, other environmental impacts, and human health and well-being, and explain the basic methods used to arrive at these social cost estimates
8. Use multi-criteria decision analysis to compare energy options and develop sustainable energy portfolios
13. Synthesize a vision for transitioning to a sustainable energy future

This course focuses on asking questions about energy issues that affect the environment, economy, individuals and society. These questions will be answered through analyzing quantitative data from organizations such as the Energy Information Administration, International Energy Agency, and others. Students will learn how to apply and compare both mathematical models of social benefit cost analysis and multi-criteria decision analysis to solve real-world energy problems.

3) For each area proposed, describe evidence of student achievement that has been and/or will be used to measure learner outcomes, and describe how this information will be used to improve learning. Indicate where the syllabus explains these assessment measures to students.

In order to evaluate the effectiveness of this course in meeting the learner outcomes identified in the Reports from General Education Assessment Working Groups, I have provided samples of my assessment plan.

Population and Environment Example:

Learner Outcome: Compare the social costs and benefits of traditional and alternative energy production, distribution, and use with respect to climate change, other environmental impacts, and human health and well-being

Task: Students will participate in weekly online discussions that will center around the social costs of traditional and alternative energy production, distribution, and use. Students will draw upon readings, lectures, and in-class discussions to contribute to these activities. Students will rotate as facilitator in these online discussions. These discussions will enable students to learn about individual costs and benefits associated with individual energy options, while the debates and final presentation will require that students make comparisons across energy options and identify tradeoffs in social costs and benefits. Each student will participate in each debate as a

presenter and audience member. The final presentation will be an opportunity to create a “commercial” for the integrated sustainable energy plan the student has designed.

Assessment Plan: The students will be assessed for multiple outcomes: demonstration of knowledge regarding the issues, the ability to collaborate to achieve a common goal. Criteria specific to General Education are: students should be able to analyze the impact of a specific human cultural practice, belief system, or political/economic policy on the supporting ecosystem.

Quantitative Literacy Example:

Learner Outcome: Compare the social costs and benefits of traditional and alternative energy production, distribution, and use with respect to climate change, other environmental impacts, and human health and well-being

Task: Students will apply the concept of social benefit cost analysis in in-class assignments and exams by using a social benefit-cost model to estimate the net costs/benefits of specific energy options, portfolios and policies. They will be asked questions that prompt them to use the model, and they will be presented with data and asked to formulate questions that the model can answer. In their final presentation, they will synthesize a plan for a sustainable energy future based on these analyses and present their recommendations in an entertaining and accessible way.

Assessment Plan: The students will be assessed for multiple outcomes: demonstration of knowledge regarding the issues, estimation, computation and presentation skills. Criteria specific to General Education are: Solve problems using arithmetical, algebraic, geometrical, statistical, or computational methods; analyze answers to quantitative problems in order to determine reasonableness; suggest alternative approaches if necessary; represent quantitative information symbolically, visually, and numerically; present quantitative results in context using everyday spoken and written language as well as using formulas, graphs, tables, schematics, simulations, and visualizations.

4) For each area proposed, describe plans for reviewing the data/information from assessment of student outcomes and indicate how it will be used to improve learner outcomes and/or revise course content and instruction.

Expected student outcomes are listed on the syllabus so that students are explicitly aware of expected learning outcomes:

Upon successful completion of this course, students will be able to:

1. Distinguish between concepts of power and energy and convert between power and energy units across a wide range of energy resources, technologies and uses.
2. Analyze data from the U.S. Energy Information Administration, International Energy Agency, and other resources in order to describe the total amount of energy used in the U.S. and world economies over time, the trends in energy intensity, the trends in energy prices, and the trends in traditional and alternative energy (TAE) shares
3. Identify the key TAE resources and technologies and describe their development costs, production structure, market characteristics, and special issues
4. Compare the social costs and benefits of TAE production, distribution and use with respect to climate change, other environmental impacts, and human health and well-being, and explain the basic methods used to arrive at these social cost estimates
5. Explain what “energy security” means, how it relates (or not) to import dependence, how it can be measured, and how TAE resources and technologies rank in terms of energy security impacts

6. Explain what a sustainable energy-environment-economy path is, what makes it sustainable, why there must be transition to it, and what the key features of the transition are expected to look like (including timing)
7. Compare centralized and distributed energy approaches and explain how each might be included in a sustainable energy path
8. Use multi-criteria decision analysis to compare energy options and develop sustainable energy portfolios
9. Describe the key policies that will facilitate the transition and explain the economics of how the policies will introduce incentives that will support the transition
10. Describe and explain the effects of TAE resources and technologies on economic growth and economic development including transition effects and those associated with moving the economy along the sustainable path
11. Identify the key economic development consequences of the development of local indigenous alternative energy resources
12. Summarize current visions for transitioning to sustainable paths in the U.S., Europe, the world, and locally
13. Synthesize a vision for transitioning to a sustainable energy future

I will administer a pre- and post-test of student knowledge specifically focused on the anticipated outcomes above, as well as a written evaluation of the course, to determine if learner outcomes are consistent with expectations. I will also collect data on how well students meet expectations over the course of the semester through exam scores, discussions, answers to in-class assignments, and the debate and presentation rubrics. I will use these data to modify instruction and make changes to the course for future years as necessary.

Section 3

FOR COURSE MODIFICATIONS:

Current catalog description (include designator, number, title, prerequisites, credit hours):

ECO 405; Sustainable Energy Economics and Policy

This course presents the economics of energy supply and use and the consequences for environmental quality, energy security, and sustainable economic growth and development. A variety of energy types are examined including fossil fuels, nuclear power, and a range of renewable energy technologies including biomass, hydro, solar, and wind power. The effects of energy on greenhouse gas (GHG) emissions and climate change, on air and water quality, and on human health are considered along with policies to mitigate these effects such as carbon prices, emissions targets, efficiency requirements and investments, and renewable portfolio standards. The effects of import dependence and indigenous resource development on energy security and regional economic growth and development are assessed. Alternative future energy paths are developed that are consistent with environmental stewardship, energy security, and sustainable economic growth and development. 3 Credit Hours. Prerequisites: ECO 120 and ECO 121, or ECO 410.

Proposed catalog description (include designator, number, title, prerequisites, credit hours):

ECO 405; Sustainable Energy Economics and Policy

This course presents the economics of energy supply and use and the consequences for environmental quality, energy security, and sustainable economic growth and development. A variety of energy types are examined including fossil fuels, nuclear power, and a range of renewable energy technologies including biomass, hydro, solar, and wind power. The effects of energy on greenhouse gas (GHG) emissions and climate change, on air and water quality, and on human health are considered along with policies to mitigate these effects such as carbon prices, emissions targets, efficiency requirements and investments, and renewable portfolio standards. The effects of import dependence and indigenous resource development on energy security and regional economic growth and development are assessed. Alternative future energy paths are developed that are consistent with environmental stewardship, energy security, and sustainable economic growth and development. This course satisfies the General Education requirements for Quantitative Literacy and Population and Environment. 3 Credit Hours. Prerequisites: ECO 120 and ECO 121, or ECO 410;

Reason for course modification:

The course currently achieves the General Education requirements for Quantitative Literacy and Population and Environment. The proposed course modification is to have the course officially recognized as satisfying the General Education requirements for Quantitative Literacy and Population and Environment.

Does this change in course prefix, number and/or credit hours affect any prerequisite? If yes, please list course(s).

N/A

For addition of Electronic Learning Component: