THE UNIVERSITY OF MAINE

NEW COURSE PROPOSAL/MODIFICATION/ELIMINATION FORM

for Undergraduate Courses (9/2011)

DEPARTMENT  School of Economics  COLLEGE  NSFA

PROPOSED COURSE DESIGNATOR  ECO  COURSE NUMBER  405

COURSE TITLE  Sustainable Energy Economics and Policy  EFFECTIVE SEMESTER  Fall 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):

_ New Course
_ New Course w/GenEd (Complete Section 2)
_ Experimental

ONE-TIME COURSE (check all that apply and complete Section 2):

_ One-time course w/GenEd
_ One-time course
_ Travel Study Course

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

X Addition of GenEd

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

_ Designator Change
_ Number Change
_ Title Change
X Description Change
_ Prerequisite Change

_ Credit Change

ELIMINATION (Complete Section 4):

_ Course Elimination

ENDORSEMENTS (Print name)  Sign Initials  Date

Leader, Initiating Department/Unit(s)

George C. Morgan  BRC  11/5/12

College(s) Curriculum Committee Chair(s)

William Ellis  WGE  11/8/12

Dean(s)

Alan Y. 12, 5

Misch  11/8/12

Associate Provost for Undergraduate Education

SM  3/28/2013
Good Morning,

UPCC has discussed your modification of ECO 405 with addition of Gen Ed. The following are some suggestions:

1) Because Quantitative Literacy does not become an active Gen Ed until Fall of 2014, UPCC will approved ECO 405 for the Math Gen Ed for now. You will not need to resubmit a course modification form for this change from Math to Quantitative Literacy that will happen Fall of 2014, Student Records will take care of that. If students who complete this class are still here in 2014 then they can retroactively receive the Quantitative Literacy Gen Ed. If a student who is enrolled currently in this class needs the Gen Ed they can speak individually with the Associate Dean.

2) The “Disruption Clause” was not within the syllabus for this course it is as follows: Course Schedule Disclaimer: In the event of an extended disruption of normal classroom activities, the format for this course may be modified to enable its completion within its programmed time frame. In that event, you will be provided an addendum to the syllabus that will supersede this version.

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Section 2
THIS SECTION MUST BE COMPLETED FOR GENERAL EDUCATION APPROVALS

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

( X) Quantitative Literacy: mathematics, statistics, computer science, formal logic
( ) Lab Science
( ) Science Applications
( ) Western Cultural Tradition
( ) Artistic & Creative Expression
( X) 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
5. Use multi-criteria decision analysis to compare energy options and develop sustainable energy portfolios
6. 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:
ECO 405: SUSTAINABLE ENERGY ECONOMICS AND POLICY
SPRING 2013 SYLLABUS

Instructor

Sharon Wagner
School of Economics
305C Winslow Hall
(207) 581-3174

Tuesdays and Thursdays
10am-11:30am

Course Communication through Blackboard

We will be using the on-line course website program called Blackboard. This website will contain all course materials – including readings, discussions, announcements and grades. www.courses.maine.edu. Please use blackboard for all email communications with the instructors. It is very important that you make sure you can access our course on Blackboard!

Email Policy

We welcome contact via email with course-related questions and do not want to discourage anyone from doing so; however, we hope that you will first attempt to use your resources (e.g., your syllabus, handouts, your peers, office hours, etc.) to address your questions before sending an email. We expect emails to us from students (and vice versa) to be composed professionally with complete sentences and proper English writing style with no spelling mistakes or cryptic abbreviations (i.e., an email is not a text message), a CLEAR subject line and a clear, concise question.

Please include in the subject line: the course number or name, the days of week the course meets, and the time during the day the course meets as we each teach more than one course. For example: ECO 405 Tu-Th 930.

We reserve the right not to respond to emails that don’t meet these qualifications!
During the weekdays, please expect at least a 36-hour turnaround time for answering emails and on weekends, the time will be 60 hours. Each professor has a different work schedule, and probably has a personal life as well.

**PLEASE only use the Blackboard mail system when emailing!**

**Course Description**

This course presents the economic, environmental, and social implications of energy supply, distribution, and use in the context of transitioning toward a sustainable energy future. A variety of energy types are examined including fossil fuels, nuclear power, and a range of renewable energy technologies including solar, wind, biomass, hydro, and geothermal power. The effects of energy use 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 development of indigenous renewable energy resources 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.

**Prerequisites**

ECO 120 and ECO 121, or ECO 410, or equivalent; or permission

**Required Texts**

There is no required text for this course. Course readings will be assigned from these sources, among others: EIA, IEA, IPCC, National Academies, MIT Press, National Labs, the New York Times, academic journals such as Energy Policy, Renewable Energy, Renewable and Sustainable Energy Reviews.

**Course Learning Objective:**

This course meets the University of Maine's general education requirement for the areas of Population and the Environment, and Quantitative Literacy. The main objective of this course is to expand your understanding of and reasoning skills related to energy choices, issues, and policies in the context of the varied social, economic and environmental implications of energy production, distribution and use.
Course 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

**Grading**

Grades will be based on performance on participation in online discussions, the completion of in-class assignments, exams and in-class debates as follows:

<table>
<thead>
<tr>
<th>Category</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>In-class assignments</td>
<td>20%</td>
</tr>
<tr>
<td>Online discussions</td>
<td>20%</td>
</tr>
<tr>
<td>In-class debates</td>
<td>20%</td>
</tr>
<tr>
<td>Exams (best 2 out of 3)</td>
<td>20%</td>
</tr>
<tr>
<td>Final presentation/report</td>
<td>20%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

All students are expected to attend class each day. Each day in class, there will be at least one in-class assignment. The two lowest grades from these assignments will be dropped. Assignments will vary, will be based on readings and class notes, and may consist of discussion, written responses, quantitative analysis, and a mixture of individual and group activity. In-class assignments count as 20% of the final grade.

Each week, students will be required to participate in an online discussion. Each student will be required to facilitate a discussion at least once during the semester. Online discussion participation and facilitation will count as 20% of the final grade.

There will be two in-class debates during the course of the semester. Each student is required to attend each debate and to present in at least one. The overall debate grade will count as 20% of the final grade.

There will be three multiple-choice exams during the semester. The lowest exam grade will be
dropped, and each of the two highest exam grades will count as 10% toward the final grade.

Each student will be required to make a presentation during the final exam period and prepare a brief report detailing the analysis that led to the presentation. This presentation will be 20% of the final grade.

In-class assignments, online discussions, debates exam and the final presentation/report will cover reading materials, class lectures and discussions/activities. Late assignments will not be accepted given the policy of dropping the lowest exam grade and 2 lowest in-class assignments.

Letter grades will be based on the weighted percentage of points earned:
A 90-100%  B 80-89%  C 65-79%  D 50-64%  F Less than 50%

Classroom policies, late assignments, incompletes
Please turn off all cell phones and electronic devices (except when taking class notes on a computer). Headphones are not allowed in class. Late assignments will not be accepted given the policy on dropping the lowest preliminary exam grade and 2 lowest in-class assignments. A grade of “Incomplete” will not be given except in well-documented and extraordinary circumstances.

Extra Help
The School of Economics has a Student Laboratory & Advising Center in Stevens Hall Room 305. You can come to get extra help at this lab including: exam preparation, prepare/discuss discussion points. This lab is also a great place to meet for group study sessions/presentation preparation. Office hours are also a great time to get extra help.

Students with disabilities
If you have a disability for which you may be requesting an accommodation, please contact Ann Smith, Coordinator of Services for Students with Disabilities (121 East Annex Building, 581-2319), as early as possible in the term.
Academic honesty (plagiarism, etc.)

Academic honesty is very important. It is dishonest to cheat on exams, to copy term papers, to submit papers written by another person, to fake experimental results, or to copy or reword parts of books or articles into your own papers without appropriately citing the source. Students committing or aiding in any of these violations may be given failing grades for an assignment or for an entire course, at the discretion of the instructor. In addition to any academic action taken by an instructor, these violations are also subject to action under the University of Maine Student Conduct Code. The maximum possible sanction under the student conduct code is dismissal from the University.

Course Schedule Disclaimer

In the event of an extended disruption of normal classroom activities, the format for this course may be modified to enable its completion within its programmed time frame. In that event, you will be provided an addendum to the syllabus that will supersede this version.
# TENTATIVE COURSE OUTLINE: ECO 405

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Assigned Readings</th>
<th>Assignments</th>
</tr>
</thead>
<tbody>
<tr>
<td>15-Jan</td>
<td>INTRODUCTION: Concepts and units</td>
<td>TBD</td>
<td>TBD</td>
</tr>
<tr>
<td>17-Jan</td>
<td>INTRODUCTION: Environmental effects</td>
<td>TBD</td>
<td>TBD</td>
</tr>
<tr>
<td>22-Jan</td>
<td>INTRODUCTION: Economics Basics &amp; Energy Trends</td>
<td>TBD</td>
<td>TBD</td>
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<tr>
<td>24-Jan</td>
<td>INTRODUCTION: Markets &amp; Policy drivers</td>
<td>TBD</td>
<td>TBD</td>
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<tr>
<td>29-Jan</td>
<td>INTRODUCTION: Carbon Pricing</td>
<td>TBD</td>
<td>TBD</td>
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<tr>
<td>31-Jan</td>
<td>POLICY DRIVERS (cont.)</td>
<td>TBD</td>
<td>TBD</td>
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<tr>
<td>5-Feb</td>
<td>ELECTRICITY MARKETS</td>
<td>TBD</td>
<td>TBD</td>
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<tr>
<td>7-Feb</td>
<td>ELECTRICITY MARKETS (cont.)</td>
<td>TBD</td>
<td>TBD</td>
</tr>
<tr>
<td>12-Feb</td>
<td>ELECTRICITY &amp; HEAT: Wind Energy</td>
<td>TBD</td>
<td>TBD</td>
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<tr>
<td>14-Feb</td>
<td>ELECTRICITY &amp; HEAT: Solar Energy</td>
<td>TBD</td>
<td>TBD</td>
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<tr>
<td>19-Feb</td>
<td>ELECTRICITY &amp; HEAT: Other renewables (biomass, geothermal, water sources (hydro/tidal))</td>
<td>TBD</td>
<td>TBD</td>
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<tr>
<td>21-Feb</td>
<td>ELECTRICITY: Fossil Fuels</td>
<td>TBD</td>
<td>TBD</td>
</tr>
<tr>
<td>26-Feb</td>
<td>ELECTRICITY: Fossil Fuels/ Shale Gas</td>
<td>TBD</td>
<td>TBD</td>
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<tr>
<td>28-Feb</td>
<td>ENERGY LAW &amp; POLICY</td>
<td>TBD</td>
<td>TBD</td>
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<tr>
<td>19-Mar</td>
<td>ELECTRICITY &amp; HEAT: Distributed generation &amp; energy storage</td>
<td>TBD</td>
<td>TBD</td>
</tr>
<tr>
<td>21-Mar</td>
<td>ENERGY EFFICIENCY</td>
<td>TBD</td>
<td>TBD</td>
</tr>
<tr>
<td>26-Mar</td>
<td>ELECTRICITY &amp; HEAT: In-class debate</td>
<td>TBD</td>
<td>TBD</td>
</tr>
<tr>
<td>28-Mar</td>
<td>NUCLEAR: Comparative Economics</td>
<td>TBD</td>
<td>TBD</td>
</tr>
<tr>
<td>2-Apr</td>
<td>NUCLEAR: Challenges</td>
<td>TBD</td>
<td>TBD</td>
</tr>
<tr>
<td>4-Apr</td>
<td>ELECTRICITY &amp; HEAT: Distributed generation &amp; energy storage (cont)</td>
<td>TBD</td>
<td>TBD</td>
</tr>
</tbody>
</table>

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1 This schedule may change as the course progresses. Changes will be announced in class and posted on First Class.
<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>TBD</th>
<th>TBD</th>
</tr>
</thead>
<tbody>
<tr>
<td>9-Apr</td>
<td>NUCLEAR: In-class debate</td>
<td>TBD</td>
<td>TBD</td>
</tr>
<tr>
<td>11-Apr</td>
<td>TRANSPORTATION: Fossil fuels</td>
<td>TBD</td>
<td>TBD</td>
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<tr>
<td>16-Apr</td>
<td>TRANSPORTATION: Renewables</td>
<td>TBD</td>
<td>TBD</td>
</tr>
<tr>
<td>18-Apr</td>
<td>TRANSPORTATION: Law and Policy</td>
<td>TBD</td>
<td>TBD</td>
</tr>
<tr>
<td>23-Apr</td>
<td>TRANSPORTATION: In-class debate</td>
<td>TBD</td>
<td>TBD</td>
</tr>
<tr>
<td>25-Apr</td>
<td>ENERGY COMPARISONS/TRADE-OFFS</td>
<td>TBD</td>
<td>TBD</td>
</tr>
<tr>
<td>30-Apr</td>
<td>SUSTAINABLE FUTURES: Scenarios</td>
<td>TBD</td>
<td>TBD</td>
</tr>
<tr>
<td>2-May</td>
<td>SUSTAINABLE FUTURES: Law and Policy</td>
<td>TBD</td>
<td>TBD</td>
</tr>
</tbody>
</table>

**FINALS**

**FINAL PRESENTATION:**
In classroom assigned

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1. The stated objectives and outcomes address the learning outcome goals for the University of Maine's general education requirement for the area of Population and the Environment, which state (in brief):

   Courses included in the Population and Environment sub-category help students to understand how humankind interacts with our finite physical and biological environment by addressing:

   (a) The role of both local and global environmental change on the quality of human life;

   (b) The pervasive role of human population growth on environmental quality and the quality of life, both in industrial and developing countries;

   (c) The influence of cultural, religious, economic, educational and political factors on population growth and environmental quality; and

   (d) Possible solutions to the population/environmental problems, which may include the role of technological advancements, a re-examination of educational and political institutions, enlightened reassessment of traditional religious and economic conceptions, and rethinking contemporary Western conception of "the good life".

2. The stated objectives and outcomes address the learning outcome goals for the University of Maine's general education requirement for the area of Quantitative Literacy, which state (in brief):

   Quantitative literacy is the ability to formulate, evaluate, and communicate conclusions and inferences from quantitative information. Upon completion of general education study in quantitative literacy, students will understand the role that mathematics and quantitative thinking plays in solving and communicating information about real world problems and relationships. Students will be able to:

   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.