Course Syllabus: BIO / EES 105 – Energy in Our World

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Professor of Biology and Environmental Science

Description:

This course addresses the concept of energy from various perspectives. In its most basic form, energy is pervasive physical force found in the universe. Energy drives all biological processes, and is the currency by which all levels of the biological hierarchy- from individuals to the biosphere – are measured.

The rise of human civilization was based on developing systems to capture energy and transform it into forms that allow us to do useful work such as growing food and providing shelter and clothing. Modern society depends upon energy to drive our machines, give us light, and regulate our thermal environment. Over the past century, the energy to satisfy that demand has largely come from fossil fuels like coal, oil, and natural gas, or (since the 1950s) from nuclear fission.

During the past thirty years, some have questioned the wisdom of depending on fossil fuels because: (1) they are often produced by countries hostile to the U.S., (2) the byproducts of fossil fuel combustion lead to potentially catastrophic climatic change, and (3) the supply of fossil fuels may be limited. Similarly, concerns over nuclear power include inherent safety of reactors and the deposition of waste material.

To address those concerns many advocate the development and implementation of alternative renewable energy like wind, solar, geothermal, biomass, and hydrogen. While those individuals laud the advent of alternatives, others express skepticism that they might not contain enough energy to meet demand, and may have their own environmental shortcomings. Moreover, within the past five years, our energy picture has been potentially transformed by new technologies to extract natural gas from deep rock. But those technologies are often perceived as risky and many advocate that they be abandoned. So how would we meet our energy demands?

Despite the fact that energy is such an important topic, our education system does not treat it as a discrete field of study – as we do for history, political science, music, biology, or economics. Within the past several years, concerns have been expressed that people suffer from "Energy Illiteracy." But yet energy is an often discussed and debated topic.

This course will explore our current energy situation, exploring the different sources of energy, the ways that they are transported to market, and whether we can – or should – take steps to reduce consumption. To answer these questions, we will take a broad perspective, including science, engineering, policy, communication, and business. The goals is to help you better understand energy in our world, and to contribute productively to ongoing discussions about production, distribution, and consumption.

This course will coordinate with an "Energy 101" initiative being developed by the Department of Energy. On that basis, it will bring to Wilkes perspectives on energy literacy being considered at the national level.

Course Objectives:

Students completing BIO / EES 105 will be able to:

- Understand the physical basis of energy in our universe, its importance in biological systems, and various ways in which it is measured.
- Understand the history of energy use both worldwide and in "developed" countries.
- Understand current trends of energy production and consumption locally, nationally, and on a worldwide basis
- Learn and critically evaluate arguments about the sustainability of fossil fuels and nuclear energy
- Learn and critically evaluate information about the benefits and weaknesses of potential sources of alternative energy source from a variety of perspectives
    - Potential energy yield
    - Economic
    - Environmental
    - Sociopolitical
- Consider whether much can be done to improve energy efficiency and reduce consumption
- Develop a well-reasoned personal philosophy about the present energy situation and the best way to move forward on developing and implementing alternative sources
- Develop the ability to meaningfully participate in a group seeking to understand a complex issue from a variety of perspectives, and communicate its findings to others.

Long-Term Objective

Students will develop a mature attitude about - and lifelong interest in - energy issues, and will assert leadership on that topic long after the course is completed.

Information delivery

Students will gain information by way of:

- Presentations and handouts given by the course instructor
- Presentations given by guest lecturers
- Guided inquiries via "Webquests" (see http://www,webquest.org/index.php)
- The Hinrichs and Kleinbach textbook
- Information provided by students

Textbook

Hinrichs, R.A. & M. Kleinbach. 2013. *Energy: Its Use and the Environment.* Brooks / Cole Cengage Learning (Available at the Wilkes Bookstore).

Assessment and Grading

Students will be assessed via:

- Individual (and possibly group) writing assignments
- Group presentations (in which each student will present)
- Periodic exams

Grading System (subject to change; students will be given fair notice of any changes):

Group oral reports	150 points
Exams	200 points
Writing assignments	50 points
Total	400 points

Grades will be assigned as follows: ≥90% = 4.0; 85-90% = 3.5; 80-85% = 3.0; 75-80% = 2.5; 70-75% = 2.0; 65-70% = 1.5; 60-65% = 1.0; <60% = 0.0. These cutoffs may be adjusted downward.

Academic Honesty:

Academic Honesty requires students to refrain from cheating and to provide clear citations for assertions of fact, as well as for the language, ideas, and interpretations found within the works of others. Failure to formally acknowledge the work of others, including Internet resources, written material, and any assistance with class assignments, constitutes Plagiarism. Cheating and plagiarism are serious academic offenses that cannot be tolerated in a community of scholars. Violations of academic honesty will be addressed at the programmatic and university levels and may result in a decision of course failure or program dismissal. (see University Student Handbook).

University *Statement on Intellectual Responsibility and Plagiarism*

At Wilkes the faculty and the entire University community share a deep commitment to academic honesty and integrity. The following are considered to be serious violations and will not be tolerated:

1. Plagiarism: the use of another's ideas, programs, or words without proper acknowledgment
2. Collusion: improper collaboration with another in preparing assignments, computer programs, or in taking examinations.
3. Cheating: giving improper aid to another, or receiving such aid from another, or from some other source.

Miscellaneous

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Office Hours: MTWRF, 10:00-11:00 A.M.
Course webpage: http://klemow.wilkes.edu/BIO-EES-105.html
Facebook: http://www.facebook.com/DrKlemow

BIO / EES 105 – Schedule of Topics

(note this schedule is subject to change)

Date	Topic / Activity	Reading
27 August	Course introduction: Energy issues, history, and literacy	1-31
3 September	Energy: Its physical basis and measurements	31-122
10 September	Energy: Importance in Biological systems, energy consumption	123-150
17 September	Exam 1; Introduction to information on the web and Webquests	
24 September	Overview of Hubbert curve, Coal, Petroleum	193-274
1 October	Overview of Conventional and Unconventional Gas, Nuclear	151-192; 413-527
8 October	Team presentations on Hubbert curve, Coal, Petroleum	
15 October	Team presentations on Conventional and Unconventional Gas, Nuclear	
22 October	Exam 2; Climate change	275-304
29 October	Overview of Solar, Wind, Hydropower	305-412
5 November	Overview of Hydrogen, Ethanol, Biomass / biodiesel, Geothermal	528-570
12 November	Team presentations on Solar, Wind, Hydropower	
19 November	Team presentations on Hydrogen, Ethanol, Biomass / biodiesel, Geothermal	
3 December	Course synthesis	571-575
xx December	Final exam	