

ENSP 350 Energy Resources: Science and Policy in the 21st Century

Fall 2014

Tuesday/Thursday 3:30-4:45 pm

Mary Mount Hall 0108

Syllabus

Instructor:

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Office Hours:

Tuesday/Thursday 2:00 – 3:15pm, or by appointment

Course Overview:

ENSP 350 will examine energy resource production and consumption, including the historical context, current trends in the U.S. and globally, and social and environmental implications. We will first review basic energy concepts and historical and current trends, and then focus on particular energy resources, including fossil fuel and non-fossil fuel based energy sources. For each of the energy source based lectures, we will discuss fuel-source formation, history of use, modern trends in consumption, production, pricing and trade, methods of production and consumption, reserves and resources, environmental and social impacts, future outlook and potential new technologies. Lastly, energy efficiency and conservation will be discussed, as well as energy use in developing countries.

Learning Outcomes

By the end of the course, students will be able to:

- Identify sources of energy in the U.S. and globally and current and historical trends in the relative amount of consumption of each by sector
- Evaluate environmental and sociopolitical impacts of energy production, transport, and trade
- Critically evaluate proposed energy system alternatives, including reliance on fossil versus non-fossil fuels
- Develop an energy profile of a given region, including energy sources and end uses, environmental impacts, and projected future trends of energy consumption and production
- Defend a policy position relating to present day energy related topics by participating in an oral debate
- Describe patterns of energy consumption and efficiency in residential, commercial and industrial sectors, sources of energy inefficiency, and current trends in energy conservation

Required Reading Material:

(Additional material will be assigned and available through ELMS Canvas System)

Barnes D.F., K. Krutilla, and W.F. Hyde. 2005. The Urban Household Energy Transition: Social and Environmental Impacts in the Developing World. Washington D.C.: RFF Press.

Freese, B. 2003. Coal: A Human History. London, England: Penguin Books.

Smil, V.S. 2006. Energy: A Beginner's Guide. Oxford, England: Oneworld Publications.

World Energy Council (WEC), 2013. World Energy Resources, 2013 Survey. London, England: WEC.

<http://www.worldenergy.org/publications/2013/world-energy-resources-2013-survey/>

White, R. 1995. The Organic Machine: The Remaking of the Columbia River. New York: Hill and Wang.

Project Assignment (Classroom Policy Debates):

Pre-assigned groups will debate topical energy and environmentally related policy positions regarding one of the following topics (topics may be revised to address any new energy-related developments):

- Expansion of the Keystone XL Oil Pipeline (Phase IV) revised proposal, 2012
- U.S. EPA “Clean Power Plan” proposal (June 2, 2014), guidelines to cut carbon pollution from existing power plants
- Increase in U.S. export of Liquid Natural Gas (LNG) to Europe (U.S. approval of additional export terminals)
- Nuclear Regulatory Commission approval to build and operate the Vogtle Nuclear Power Plant in eastern Georgia (approved 2012)
- Maryland Offshore Wind Energy Act of 2013
- U.S. Energy Savings and Industrial Competitiveness Act of 2014

In the initial presentation, groups should lay the case for their assigned policy position (for or against). Along the way, groups should also provide opinions on the policies of the opposing policy position, as if they were representing their position to an elected decision maker.

After each of the four groups has made an initial presentation, each group will respond to arguments made about their policy position by the opposing group. The Lecturer and student audience will also have an opportunity to ask questions and pose ideas during the debate. Each side will then make a final case for their energy policy position.

Presentations will be graded on accuracy and completeness of the information provided regarding their policy positions as well as those of their opposition; presentation style and coherence; and the overall ability of each group to advocate/defend for their policy position.

Each student in a group must present. The same grade will be assigned for all members in the group.

Paper Assignment (Energy and Environmental Profile)

Each student will prepare a paper that describes energy and environmental related issues for a specific country, region, city, or state that they will be assigned in consultation with the Lecturer. The paper shall address the following:

- The amounts of energy inputs used in the region (i.e., coal, oil, natural gas, nuclear, hydroelectricity, biomass) and the relative amount of energy used by different sectors (i.e., residential, industry, transportation, commercial).
- Energy reserves and resources of the region – both fossil fuels and non-fossil fuels
- The relative amounts of energy imports, exports, and domestic production
- The primary environmental and social implications of energy production and use in the region
- An appropriate context for the energy patterns of the region – e.g., how are they shaped by available resources, the economy, and major industries?
- Plans the region has for future production and consumption of energy in the next several years and the driver for any planned changes.
- Major energy-related policies (e.g., laws, regulations, subsidies) that have been implemented within the region; objectives of these policies, and observed effectiveness in reaching these objectives

To summarize some of this information, you should prepare an ‘energy flow diagram’ similar to that prepared by the Energy Information Administration for the U.S. that will be shown several times in class. The flow diagram should be designed so that the ‘arrows’ are sized proportionately. The report should also include additional figures and charts similar to those used in course lectures (e.g., trend graphs of energy consumption and production changes over time), that are either created by the student based on available data, or are reproduced and cited appropriately.

Evaluation and Grading Criteria

A total of 100 points is possible from four cumulative sources; (a) Mid-term test 30%; (b) Final examination 30%; (c) Project Report 25%; and (d) Project Presentation 15%.

Grades will be determined based on the following distribution: 100-98% = A+, 97-92 = A, 91-90 = A-; 89-88 = B+, 87-82 = B, 81-80 = B-; 79-78 = C+, 77-72 = C, 71-70 = C-; 69-68 = D+, 67-62 = D, 61-60 = D-; ≤ 59 = F.

Course Policies

Late Policy

Unless you see me in advance of the due date and obtain an approved excuse, 5 percent of the total possible points will be deducted from your score for every day the assignment is late, including weekend days. (So, for example, on a 100-point scale, a student who would have earned a 94 on a timely paper will earn 89 if the same paper is turned in one date late, 84 if turned in 2 days late, etc.).

Attendance and Absences:

In accordance with University policy, students are expected to attend classes regularly and on-time. Attendance will not be taken on a regular basis, but failure to attend class is likely to impact your grade because the lecture materials will be a primary source of exam material.

An absence will only be considered excused under the circumstances described by the University's attendance policy, available at:

<http://www.umd.edu/catalog/index.cfm/show/content.section/c/27/ss/1584/s/1540>.

Academic Accommodations:

If you have a documented disability, please contact Disability Support Services 0126 Shoemaker Hall. Each semester students with documented disabilities should apply to DSS for accommodation request forms which you can provide to your instructors as proof of your eligibility for accommodations. The rules for eligibility and the types of accommodations a student may request can be reviewed on the DSS website at <http://www.counseling.umd.edu/DSS>. Please provide your documentation to me well in advance of any scheduled due dates or exams so that I can be sure that all of your accommodation needs are satisfied.

Religious Observances

The University System of Maryland policy provides that students should not be penalized because of observances of their religious beliefs. Students shall be given an opportunity, whenever feasible, to make up within a reasonable time any academic assignment that is missed due to individual participation in religious observances. *It is the responsibility of the student to inform the instructor of any intended absences for religious observances in advance.* Notice should be provided as soon as possible but no later than the end of the schedule adjustment (drop/add) period.

Code of Academic Integrity

Academic dishonesty (such as cheating on exams, plagiarism from the internet or other students, submitting the same paper for credit in two courses without authorization, buying papers, submitting fraudulent documents and forging signatures) is unacceptable and will result in referral to the Student Honor Council after which a determination of a violation will result in a failing grade in the course and a note on your transcript indicating a violation of the rules of academic integrity. The University's Code of Academic Integrity sets standards for academic integrity at Maryland for all undergraduate and graduate students. As a student, you are responsible for upholding these standards for this course:

1. No cheating ("intentionally using or attempting to use unauthorized materials, information, or study aids in any academic exercise");
2. No fabrication ("intentional and unauthorized falsification or invention of any information or citation

in an academic exercise”);

3. No facilitating academic dishonesty (“intentionally or knowingly helping or attempting to help another to violate any provision of this Code”);
4. No plagiarism (“intentionally or knowingly representing the words or ideas of another as one's own in any academic exercise”).

For more information on the Code of Academic Integrity or the Student Honor Council, visit www.shc.umd.edu.

Copyright Protection for Class Materials

Commercial firms have been paying students to take notes and collect course materials, which are then copied and sold. Course materials that exist in a tangible medium, such as written or recorded lectures, Power Point presentations, handouts and tests, are copyright protected. Students **may not** copy and distribute such materials except for personal use and with the instructor's permission.

Course Evaluation

Your participation in the evaluation of courses through CourseEvalUM is a responsibility you hold as a student member of our academic community. Your feedback is confidential and important to the improvement of teaching and learning at the University. By completing all of your evaluations each semester, you will have the privilege of accessing online, at Testudo, the evaluation reports for the thousands of courses online at Testudo. Evaluations can be completed at www.courseevalum.umd.edu.

The Concept of Sustainability for Human Societies, Economies, and Their Supporting Natural Resources: Links to Your Education at the University of Maryland and This Course

In this course, you will engage in learning about humanity's relationship with global energy resources. Through a balance of conservation and preservation, humans forge modern complex societies while using ecosystem services and natural resources, including energy resources. In so doing, they affect the potential for future human cultures to meet their basic needs and for ecological systems to maintain their characteristic material cycles and energy flows. The concept of sustainability embodies these ideas and has become a central tenet of environmental science and policy in recent years.

In 1987, the World Commission on Environment and Development published *Our Common Future* (Oxford University Press), also known as the Brundtland Report (after its chair, Gro Harlem Brundtland, former Prime Minister of Norway). Sustainable development is defined in this seminal report in this way:

"Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs."

Questions and concerns about sustainability and future generations have been linked to urban development and energy use. In this course, you will have the opportunity to incorporate new thinking and learning related to sustainability into your intellectual experience and growth. The intellectual concept of sustainability embodies the judicious use of energy resources by humans.

The Office of Sustainability at the University of Maryland has initiated the Chesapeake Project to infuse the undergraduate experience with learning and thinking surrounding sustainability at many levels, from

individual courses to program curricula, campus life, regional issues, and global concerns. Their website is <http://www.sustainability.umd.edu/>. The International Institute for Sustainable Development is an excellent site for general information on sustainability at <http://www.iisd.org/sd/>. You are encouraged to consult these and other resources during the semester and after completion of this course.

Course Agenda

Part I: Introduction, historical context, and modern trends.

September 2 / September 4. Course Introduction and Basic Concepts in Energy: Energy, power, units, thermodynamics, conversions, photosynthesis, electricity generation.

Reading: Smil, Ch 1-2.

September 9 / September 11. History of energy use: From pre-history until the industrial revolution.

Reading: Smil, Ch 3; White, Ch 1.

September 16 / September 18. Trends in modern energy consumption and production: Energy production and use by sector, source, and location.

Reading: Smil, Ch 4-6.

Part II: Fossil-fuel based energy resources

September 23 / September 25. Coal and electricity

Reading: Freese, all; WEC, Ch 1.

September 30 / October 2. Oil and transportation

Reading: WEC, 2

October 7 / October 9. Natural gas and hydraulic fracturing

Reading: WEC, 3

October 14 / October 16. Midterm examination review and Midterm examination

Part III. Non fossil-fuel based energy resources

October 21 / October 23. Hydroelectricity and wind-generated electricity

Reading: White, 2-4; WEC, Ch. 5, 10

October 28 / October 30. Nuclear

Reading: WEC, Ch 4.

November 4 / November 6. Geothermal and Biomass-based fuels

Reading: WEC, Ch 6, 7, 9.

November 11 / November 13. Solar and Marine Energy

Reading: WEC, Ch 8, 11

November 18 / November 20. Project Presentations

Part IV. Energy Conservation and U.S. Federal Energy Policy

November 25. Energy efficiency and conservation: Historical improvements, current trends and technologies, efficiency by sector and end use.

Reading: TBD

December 2 / December 4. U.S. Federal Energy Policy.

Reading: TBD

Part V. Energy Use in Developing Countries

December 9 / December 11. Energy in the developing world: Energy use transitions, environmental, public health, and social impacts.

Reading: Barnes et al., all.