

GEOS 190 Energy and the Environment (Q Course) Spring Term, 2016

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Office Hours: By appointment or stop by anytime.

Class: 8:00-9:00 a.m., MWF, Rm. 222, Julian S&M.

Text: Energy for Future Presidents: The Science Behind the Headlines by Richard A. Muller, 2013. W. W. Norton & Company, New York. ISBN 978-0-393-34510-0.

Course Outline and Tentative Schedule

<u>Week</u>	<u>Topic</u>	<u>Reading Assignment</u>
Part I: Energy, Nature, Human Society, and the Environment		
1	2/1 Syllabus; Introduction to Energy; DVD: Switch (98 minutes); Assignment #1	Preface; Introduction
2	2/8 Energy; World Energy Consumption; China; India; United States; Peak Oil; Efficiency; Conservation; Assignment #2	pp. 77-85 Ch. 7
3	2/15 Energy Mechanics; Assignment #3	pp. 281-290
4	2/22 EXAM I: Wednesday, February 24	
5	2/29 Energy in Nature and Human Society; Assignment #4	
6	3/7 Electrical Energy; Assignment #5	
7	3/14 Energy and the Environment; Assignment #6	Ch. 3
Spring Recess 3/19 – 3/27		
8	3/28 EXAM II: Wednesday, March 30	
Part II: Nonrenewable Energy Resources		
9	4/4 Introduction to Fossil Fuels; Conventional Oil; Shale Oil; DVD: Crude Impact (97 minutes); Assignment #7	Ch. 2; Ch. 5; Ch. 6
No classes – Wednesday, April 6		
10	4/11 Natural Gas; Fracking; DVD: Gasland (106 minutes) Assignment #8	Ch. 4
11	4/18 Coal; DVD: Burning the Future: Coal in America (89 minutes) Assignment #9	Ch. 19
12	4/25 High-Tech Fossil Fuels; Nuclear Power Assignment #10	Ch. 1; Ch. 11; Ch. 14
EXAM III: Wednesday, April 27		
Part III: Renewable Energy Resources		
13	5/2 Solar; Wind; Biofuels; Fuel Cells Fusion; Geothermal; Tidal; Wave Assignment #11	Ch. 8; Ch. 9; Ch. 12 Ch. 13; Ch. 15 Ch. 18
Part IV: Energy for the 21st Century		
14	5/9 The Energy Future: Transportation, Agriculture, and Cities DVD: The End of Suburbia (78 minutes)	Ch. 10; Ch. 16; Ch. 17 pp. 291-305
Final Exam (Comprehensive): Wednesday, May 18, 8:30-11:30		

The Topic

The era of cheap, abundant energy provided by fossil fuels will end during your lifetime. Major changes in human society will occur as we strive to make the transition from non-renewable, polluting fossil fuels to renewable and sustainable alternatives. Some doubt that we can make this transition and predict that modern industrialized societies will begin to collapse in the not too distant future. Others believe that technological innovation, that has been the hallmark of human existence, will enable us to make this transition successfully. Whatever the outcome, make no mistake about it, the way we live, work, play, and interact is going to change drastically during this century. This is an interdisciplinary topic. It involves science, mathematics, politics, economics, sociology, demographics, and many other disciplines. No matter what your interests are, you have to be interested in this.

The present energy landscape is changing rapidly. Emerging economies, particularly in China and India, are consuming an increasing supply of the world's energy resources that are presently provided mostly by nonrenewable fuels (oil, coal, natural gas, and uranium). Most of the increase in demand for energy during the next 30 years will come from developing countries. Although progress has been made in the development of renewable energy resources, new technologies such as horizontal drilling and hydraulic fracturing ("fracking") have opened up vast new reserves of relatively cheap natural gas and oil that were previously thought to be inaccessible. Whereas this may bode well for energy security for the near future, the environmental consequences of continuing to rely mostly on fossil fuels for our energy to power modern industrialized economies could be disastrous.

Course Objectives

After completing this course, you should know...

- ✓ the present sources of energy and how different fuels are used in industrialized societies.
- ✓ how energy resources form and the difference between renewable and nonrenewable energy resources.
- ✓ the difference between an energy source and an energy carrier.
- ✓ the environmental impacts of using energy resources.
- ✓ the truth about climate change.
- ✓ how to do basic calculations to compare the quality, efficiency, and environmental impacts of different energy resources.
- ✓ future scenarios for energy resources and sustainable societies.

Grading

Your course grade is based on your class participation, three semester exams, and a comprehensive final exam. These components are weighted as follows:

Participation	10%
Exam I	20%
Exam II	20%
Exam III	20%
Final Exam	30%

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

(Note: I will lower these ranges slightly if warranted by the class grade distribution.)

Q Certification

You must receive a course grade of at least a C- to receive Q certification.

Class Policies

1. DePauw University is committed to providing equal access to academic programs and university-administered activities with reasonable accommodations to students with documented disabilities. If you believe you may need an accommodation based on the impact of a disability or learning challenge you are strongly encouraged to contact Student Disability Services (SDS) for information on how to receive accommodations and support. Accommodations cannot be implemented until the faculty member has received the official ADA letter. It is critical that you discuss the accommodations specified in your letter with each faculty member receiving the letter. Accommodations are not retroactive. Students with documented disabilities have the right to choose not to use accommodations, and in exercising that right, they accept the resulting outcomes. This means that faculty members are under no obligation to retroactively address any issue arising from students' choices to forgo accommodations. Student Disability Services is located in the Memorial Student Union Building, suite 200. 765.658.6267 or - studentdisabilityservices@depauw.edu
2. Regular and punctual attendance is expected and monitored. Poor attendance and preparation for class will result in refusal on my part to give you reasonable attention and guidance in make-up work. I realize that an occasional absence is necessary, particularly if you are sick. You also may need to miss class because of an extracurricular activity that contributes to your overall education, career objective, or well-being (e.g., field trip for another class, job interview, professional conference, workshop participation, doctors appointment, student-athlete participating in a sporting event). Send me an e-mail message either before the missed class or soon after the missed class so that I know your reason for missing class. See the Student Handbook for the University policy on attendance:
<http://www.depauw.edu/handbooks/academic/policies/attendance/>
3. Cell phone and computer use during class are not allowed. Use of your cell phone or computer is considered disruptive behavior because it distracts the students around you and it distracts me. Turn your cell phone to vibrate, turn your computer off, and put them both away so that they are out of sight for the entire class period. Placing your cell phone in the opening beneath the table is not considered out of sight. My phone is set to vibrate in the event of an emergency message broadcast from DePauw Public Safety. There may be rare instances where you might expect an important call during class (e.g., illness

in the family; potential employer). Alert me before class starts that you are expecting an important call and you may leave class should you need to use your phone.

4. Food is not allowed in the classroom, however you may bring a beverage to class. Please clean up the table and your seating area after class so that the area is clean for the next person to use the seat.
5. Remain in your seat throughout the class session. Use the restroom before you come to class and do not move about the classroom during class. In rare instances, you may need to visit the restroom during class. Please feel free to do so, but don't make it a daily habit.
6. Make-up examinations are normally not given; however, I will consider requests for make-up exams on a case-by-case basis. Students who have legitimate conflicts (e.g., travel for athletic events or other extracurricular activities) should consult with me well in advance.
7. Academic dishonesty is not tolerated. Academic dishonesty includes, but is not limited to, cheating, fabrication, facilitating academic dishonesty by another student (e.g., allowing another student to copy your answers on a test), and plagiarism. Use of any electronic device other than a calculator during exams and quizzes is not permitted and is considered cheating. All students should read and understand DePauw University's Academic Integrity Policy, which may be found at:

<http://www.depauw.edu/handbooks/academic/policies/integrity/>

Violations will be handled in accordance with established University procedures as described in the Academic Integrity Policy.

Keys to Success in this Course

1. Read the assigned material in the book in advance of lecture over that material. As you're reading, note any questions that you have.
2. Ask questions. The only stupid question is one that is not asked. Because you will be responsible for material in each assigned chapter whether that material is specifically covered during lecture or not, it is essential to ask questions to clarify any concepts that you do not understand. Please do not be too shy, embarrassed, intimidated, or afraid to ask questions.
3. Take good notes. Students with complete notes seem to do better in class. Try to write down the key material from the lecture and include as many sketches as possible. Rewriting your notes will make them more legible and orderly, plus it will help you focus on areas that are still unclear. Be careful of falling into "TV-watching mode", as it is easy to look at the pictures and not take down any notes.
4. Create your own study aids. Some people like to highlight text in the chapter, others like to make flash cards, and still others like to study in groups and discuss the material. Feel free to experiment with what works for you. In addition, the Academic Resource Center in Asbury Hall (room 115) has Q tutors and trained people available to help you refine and improve your study habits and techniques. Because different people have different learning styles and because I am not trained in that field, I struggle to help people with questions like "I studied really hard for this test, but I still got a bad grade. What should I do?" (in fact, the intent of these tips is to avoid this problem). I'm much more adept at answering geoscience-specific questions like "I don't understand how oil forms. Can you explain this to me?"
8. Study the material on a regular basis. Maintain good study habits by regularly working with the assigned material. "Cramming" just doesn't work for most of us. Get comfortable with the material as we go along so that you don't fall behind.
9. Problem solving is a skill that must be developed. You develop this skill by attempting to work the problem sets each week before I go over them in class. Even if you get "stuck" and cannot come up with an answer, or if you get a wrong answer, the attempt that you made is instructive in itself. When you finally see how to solve the problem correctly, you will instantly recognize where you were "stuck" or where you made a mistake that caused you to end up with the wrong answer. This process will help you develop problem-solving skills.
10. Study for exams as an individual and then as a group. Different people study in different ways. I've found that it helps to study as an individual first (thinking about and learning the important concepts that were emphasized in each chapter & lecture), then get together with others and study as a group (e.g., asking each other questions, brainstorming about what will be on the test, etc.).

If you feel lost or frustrated with any aspect of this course, please talk to me so that we can work together to resolve your difficulties.