Physics 016: Energy, Oil, & Global Warming
Spring 2007, TTh 1:30-3

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Materials:

The textbook is Hinrichs & Kleinback: *Energy: Its Use and the Environment*, 4th edition, Thomson Brooks/Cole 2006. Homework assignments, notes, study guides, review materials, links to additional readings, and other information will be posted on the Blackboard site for this course. We will have 1 or 2 field trips to power plants, etc.

Course Goals:

The first goal is to become a scientifically literate member of society, able to analyze individual and collective choices on quantitative bases backed up by experiments and calculations. You should be able to recognize propaganda or BS, or claims that violate basic laws of physics.

Our subject will be the production and consumption of energy in the US and the world. The existence of post-agrarian society is made possible by, and desperately dependent upon, the use of large quantities of energy, primarily from fossil fuels. This has enormous political and environmental costs that will only become more severe. Our aim is to understand the methods, costs, risks, and potential of strategies to continue the industrial age through the current century.

We will first learn what energy is and get an overview of how it is produced and used. We next learn the physical principles that underlie various modes of production and consumption of energy. We will calculate life-cycle costs for each mode, and examine the capacity of each energy source. An important aspect of fossil-fuel consumption is its effect on global climate: we will understand the physics of the greenhouse effect and examine present-day measurements and long-range forecasts for it. With these quantitative tools we will examine the major potential energy sources (fossil fuels, biomass, solar, hydro, wind, nuclear, geothermal, and fusion) and energy consumption (transportation, lighting, heating/cooling).

Prerequisites: Algebra and geometry. No previous study of physics is assumed.

Course Requirements:

1) There will be 1 **midterm**, one hour long (see schedule below), counting for **20%** of the course grade. No makeup midterms or finals will be given except in cases of dire illness, or of severe schedule conflicts brought to my attention at least a week in advance. The exams will be *open book*, to help you focus on *ideas* instead of memorization. Questions are a mix of multiple-choice, short answer, and short essays.
2) There will be a **final exam**, 1.5 hours long, which counts for **25%** of your course grade. The final will cover the whole semester, with emphasis on the last third of the course.

3) H**omework** will comprise **25%** of your grade. The lowest homework score of the term will be dropped.

4) A **research paper** will be **20%** of the course grade. You will choose an issue or question relating to energy production or consumption and be expected to produce quantitative answers to this question, *e.g.* "what is the potential impact of gas-electric hybrid vehicles on US gasoline consumption?" or "what are the economics and environmental consequences of Brazil's sugar-cane ethanol production?". Details of the assignment will be distributed separately.

5) **In-class questions** will comprise **10%** of your grade. You will be a member of a group of 3-4 students who will work together to come up with an answer to a question I pose in class. Most lectures will include one such question.

Course Schedule:

The schedule of material covered may be adjusted, but exam dates will not change.

Week:	***Topics:***	***Textbook Chapters:***
January 8	What is energy?	2, 3
January 15	Overview of US & worldwide energy budget	1
January 22	Energy conversion; heating and cooling	3, 4, 5
January 29	Atoms & light; Consumption: Lighting	13A-C, 12A-D, H
February 5	Solar Energy; Global Warming	6, 9
February 12	Fossil fuels	7, 8
February 19	Fossil Fuels (cont'd)	
	February 22: Midterm Exam	
February 26	Electricity concepts, production, & economics	10, 11
March 5	*No classes – Spring Break*	
March 12	Hydro/Wind	12
March 19	Biomass	17
March 26	Transportation	TBD
April 2	Nuclear Fission	13, 14, 15
April 9	Nuclear Fusion; Geothermal	18
April 16	Scenarios for the future	
	Final Exam: May 4, 9-11 AM	