

ISEN 120: ENERGY, SCIENCE AND SOCIETY

TuTh 2:00 – 3:20 pm, Tech LR3

Syllabus 1/14/10

Updated 2/5/10

Instructors: Harold H. Kung, Chemical and Biological Engineering, hkung@northwestern.edu
Office Hours: E-mail for an appointment
Susan Thistle, Social Studies, s-thistle@northwestern.edu
Office Hours: Wed 2:30-4:30 1808 Chicago Room 104

Teaching Assistants:

Cary Hayner CaryHayner2013@u.northwestern.edu
Beth Ulion ElizabethUlion2009@u.northwestern.edu

Graders:

Allison Juster a.juster@u.northwestern.edu
Vennesa Williams vennesawilliams2013@u.northwestern.edu

Discussion sections (optional):

Tuesday 3:30 – 4:30 pm, Tech L160
Wednesday 2:00 – 2:50 pm, Tech L150

Office Hours:

Cary Hayner Wednesday & Friday 4:00 – 4:50 pm, Tech NG43
Beth Ulion Thursday 11:00 – 11:50 am, University Library, tables in computer area near checkout

Course Summary

Basic physical principles of energy, energy production and consumption, and efficiency. Technology in energy conversion. Roles played by energy resource availability in business strategies and international politics, and technology development, economics, and policy on human and societal choices, focusing on oil, electricity, and bioenergy as examples of renewable resources.

Grading System

Evaluation will be based equally on three in-class examinations (30%, 35%, 35%). Bonus credits will be rewarded to students with active, meaningful in-class participation.

In-class exams: 1/19 (Tue), 2/11 (Thur), 3/4 (Thur)
Closed book, no cell phones, iPhones, computers, etc.
No make-up exams.

Homework

There will be no homework assignment. Exam questions will be based on lecture materials and reading assignments.

Electronic Devices

All cell phones must be turned off.
No web-surfing.

Course schedule

Week One

- 1/5 Introduction - Our reliance on energy and current patterns of energy use (supply & consumption); energy and economic growth. Overview of course (Kung, Thistle)
- 1/7 Why such patterns are a problem -finite resources, global warming, war, social inequality, environmental harm. (Kung, Thistle)
Readings: Roberts, *End of Oil*, Chapter Five, "Too Hot";
Bent et al., *Energy Science, Policy, and Pursuit of Sustainability*, pp. 83-86, 107.
Yeomans, Oil, Anatomy of an Industry, Chapter 1.

Week Two

- 1/12 Physics of energy – Concept: energy is conserved; a new look at meaning of energy production, consumption. (Kung)
Readings: Eberhart, *Feeding the Fire*, Chapters 2 and 3.
- 1/14 Physics of energy – Concept: not all energies are equal; >wasted= energy and conservation of energy. (Kung)
Readings: Eberhart, *Feeding the Fire*, Chapters 4 and 5.

Week Three

- 1/19 Exam no. 1: in-class
- 1/21 How did we get here? Social and political forces shaping energy use over past 50 years. (Thistle)
Readings: Elliot, *Energy, Society and Environment*, Chapter One, Technology and Society.
Hertsgaard, *Earth Odyssey*, Chapter 3, The Irresistible Automobile, selected pp.

Week Four

- 1/26 Basic sciences of common energy sources – energy contents in oil, gas, coal; efficiencies in their uses for electricity generation and end use, transportation, heating in nat sci terms. (Kung)
Readings: Eberhart, *Feeding the Fire*, Chapters 9 and 10.
- 1/28 How do we move toward better ways of using energy? Role of markets, government, social movements. What social and political obstacles hinder changes in production and use of electricity, for example? (Thistle)
Readings: Clapp and Dauvergne, *Paths to a Green World*, Chapter 1, Peril or Prosperity?
Roberts, *End of Oil*, Chapter 11, The Invisible Hand

Week Five

- 2/2 A closer look at coal and oil - positive and negative sides of this source of energy from a natural science perspective, and electricity – why is it so attractive (based on physics of energy); sources and technology of production (fossil fuel, solar, and wind) in science and engineering terms. (Kung)
Readings: Bent et al., *Energy Science, Policy, and Pursuit of Sustainability*, Chapter 3;
Eberhart, *Feeding the Fire*, Chapters 3, 9 and 10.
- 2/4 Nuclear power – more in depth treatment in nat sci and engineering terms (Lewis)
Readings: <http://science.howstuffworks.com/nuclear-energy-info.htm>

ISEN 120: ENERGY, SCIENCE AND SOCIETY

Course outline and readings continued

Week Six

2/9 Comparative analysis of use of nuclear power (France vs US, for example). How social movements and policy can shape energy use, such as relatively low use of nuclear power in U.S. vs other countries. (Thistle)

Readings: Harper, *Environment and Society*, selected pages and Sovacool, *The Dirty Energy Dilemma*, selected pages. (Selected pages on Blackboard under Course Documents)

2/11 In class Exam. No. 2.

Week Seven

2/16 Some policies and business strategies to reduce energy problems – utility regulation and true cost and pricing of electricity. (Kiesling)

2/18 Some policies and business strategies to reduce energy problems - the market, carbon tax vs carbon cap and trade. (Witte)

Readings: To be posted on Blackboard

Week Eight

2/23 Other renewable energy alternatives – focus discussion on bioenergy, introduction to engineering system analysis and discussion on energy conversion efficiencies. (Kung)

2/25 How do societies implement alternative energy solutions? Grassroots activism, elite reformers, and government regulation. (Thistle)

Readings: Suzuki and Dressel, *Good News for a Change*, Chapter 8, *Wrestling with Pluto*, selected pp.

Week Nine

3/2 Efficiencies and conservation. (Kung/Thistle)

3/4 Exam no. 3; in class.