Energy

IDSEM 1575
Spring 2014

MW 9:30-10:45
1 Washington Place, room 527

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Energy makes the world work. Originally an obscure concept of natural philosophy, energy has become the foundation for our international economy, social structures, political policy, and everyday life. Energy explains how cars run, the sun shines, and our cell phones ring, but also why Saudi princes are wealthy and Iowa corn farmers receive massive government subsidies. This course examines the nature of energy as a physical concept, its materialization in the engines of the industrial revolution, the construction of an energy infrastructure for electricity and oil, and the emergence of energy as the focus of economic and political conversation. We will use simple equations and math to learn what energy is and the laws that govern it, and how those simple equations help us understand the amazingly complex industrialized world in which we live. We will discuss energy production, transmission and use, and grapple with the problem of alternative energy in technical, social, and political detail.

Goals

- Understand the science, politics, and social context of energy
- Improve research skills
- Improve communication skills
- Improve numeracy and quantitative reasoning
- Achieve energy literacy

You will be spending most of your effort on out-of-class research and group presentations and projects. You will be researching different kinds of energy and energy sources and teaching your peers about them. As a class we will conduct and publically present an energy assessment of the Gallatin school. Everyone will also conduct an energy assessment of themselves. The final assignment for the class will be either a group project on the energy future of New York City, or individual projects of your own design. There will also be at least two field trips to visit energy infrastructure in the area.
The course grade will be determined as follows:

Two presentations: 10%, 10%
Two Wiki contributions: 5%, 5%
In-class quantitative work: 10%
Personal Energy Assessment: 15%
Gallatin Energy Diagram: 10%
Final project: 15%
Class participation: 20%

It is expected that you know how to write clearly. Everything you write for this class should have an argument, a thesis statement, and sources cited with quotations marks and footnotes. It is also expected that you have taken high school algebra and chemistry and are comfortable looking at and manipulating large numbers. If you are not confident in your ability to do these things, contact me right away.

**Do not plagiarize.** If you take more than two or three words directly from a textbook or another source (including the Internet), you must put them in quotation marks and cite their source in a footnote. As a Gallatin student you belong to an interdisciplinary community of artists and scholars who value honest and open intellectual inquiry. This relationship depends on mutual respect, responsibility, and integrity. Failure to uphold these values will be subject to severe sanction in accordance with the Student Discipline Rules of the Gallatin School of Individualized Study. Familiarize yourself with Gallatin’s academic integrity and plagiarism policies at http://gallatin.nyu.edu/academics/policies/integrity.html

**Late policy:** Late assignments will lose a full letter grade for every 24 hours they are late. Assignments five days late will not be accepted.

If you have a documented disability and anticipate needing accommodations in this course, please make arrangements to meet with me soon.

We will be using these books, all available at the bookstore:

- Rabinach, Anson. *The Human Motor*
- Kamkwambe, William. *The Boy Who Harnessed the Wind*
- Nye, David. *Consuming Power: A Social History of American Energies*

You will also need a calculator that can do square roots. There are many inexpensive smartphone apps that can do this.

Many of the readings are in the course reader. On the syllabus, reading assignments in the reader are marked (R). Some readings will be on the course website, marked with (W).
Class Schedule

January 27
Introduction

Part I The Nature of Energy

29 Energy Conservation (Smil 1-6, 14; Helmholtz, “On the conservation of force” (R))

Feb 3 Entropy (Thomson, “On a universal tendency in nature to the dissipation of mechanical energy” (R))

5 Presentations: Kinetic Energy, Potential Energy

10 The Least Action Principle (“Derivation of the laws of motion” (R); Presentation: Heat

12 Presentations: Light and Sound; Electricity and Magnetism

Feb 17 No class. Start tracking your electricity usage.

19 Presentations: Nuclear Energy; Chemical Energy

24 Presentations: Life; Environment

26 Personal Energy Assessment 1

March 3 Personal Energy Assessment 2

5 Energy Flow Diagram for Gallatin 1

10 Energy Flow Diagram for Gallatin 2

12 Heterodoxy 1: Chi (“Li, Qi, and Shu”; Chinese medicine readings)

March 17-23 Spring break

Part II Using Energy

24 Energy of society (Human Motor, 69-83, 238-249, 253-262, 289-300)

26 Consuming power I (1-12, 71-128; Smil 257-264; "Electrical House that Jack Built"(R))

31 Consuming power II (187-246)

April 2 Pollution and global warming (Smil, 29-36, 307-333; Fresse, Coal 163-197 (R))

7 Presentations: Premodern; Fossil Fuels (electricity)

9 Presentations: Fossil fuels (transportation); Nuclear power
14 Presentations: Geothermal and biofuels; Wind and Hydro (The Boy who Harnessed the Wind)

16 Presentations: Solar; Fringe

21 Energy storage and transmission (Mieszkowski, "The dirty green line"; "Green Power Superhighways" (R))


28 Crisis and sustainability (Smil 268-272; Richard Heinberg, The Party’s Over, 1-7, 185-224. E-book through Bobcat)

30 Policy ("Energy Innovation"; Policy speeches TBA; Muller 112-138)

May 5 Stabilization wedges

7 Heterodoxy 2: Orgasms (Wilhelm Reich, “The discovery of the orgone” or “What is orgone energy?” (R))

May 12 Final Projects due.