

GEOS 24705/34705, ENST 24705 (2012)

Energy: Science, Technology, and Human Usage

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Teaching assistants: Eric Stutz, Michael Glotter

Field trip coordinator: Grant Wilder

Website: <http://geosci.uchicago.edu/~moyer/GEOS24705/2012>

Description

This course covers the technologies by which humans appropriate energy for industrial and societal use, from steam turbines to internal combustion engines to photovoltaics. We will discuss the physics and economics of the resulting human energy system: fuel sources and relationship to energy flows in the Earth system, the history of human appropriation of energy, costs and feasibility of alternative technologies. The course is intended to provide a technical foundation for students interested in careers in the energy industry or in energy policy.

Besides lectures and problem sets, the course involves experiences with energy technology in labs and field trips. Both labs and field trips are intended to be enriching opportunities to explore technology in a hands-on way: visiting, touching, using, dis-assembling. Students are required to participate in a minimum of 3 field trips and 4 labs during the quarter, but in practice many students attend nearly all field trips and labs. Field trips for 2011 include the Fisk Power Plant (coal-fired), Grand Ridge wind farm, Dresden Nuclear Plant, BP Whiting oil refinery, Argonne Advanced Automobile Laboratory (and solar photovoltaic research facilities), and a major steel mill (either U.S. Steel or Arcelor Mittal), as well as local options (including the U. Chicago's own steam and chilled water plants). Labs include human power, radiation and lighting, electric motors, internal combustion engines, and solar photovoltaics. Enrollment is limited to 35 students to make trips and labs possible.

The course grade is determined by bi-weekly problem sets and by a final group project. Typical group projects are research papers involving some investigation of feasibility or cost-effectiveness of an energy system, but groups are also permitted to opt for design-and-build projects. In 2010 one group built a wind turbine and another a bicycle-powered electrical generating system. Some funding is provided for materials in the case of build projects.

Prerequisites

The course is intended for students with some background in physics, and a year of undergraduate-level physics is the recommended preparation. Motivated students with less science preparation can take the course and do well - the

teaching assistants are committed to working with each student as needed to bring them to the same level - but those coming from thinner science backgrounds should plan their schedules appropriately to manage the time commitment. In practice course enrollment tends to be split between students from the sciences, from public policy, and from the business school or economics. Problem sets have a base of questions that require no calculus, and generally additional optional problems for science majors and those wishing to go deeper into the material.

How to request consent to enroll

To request enrollment, send a paragraph or two describing your background, reasons for interest in the class, and what you think you'll get from the class, to Liz Moyer at moyer@uchicago.edu. Put "GEOS24705" in the subject line. The consent requirement is in part to get a balanced class with students of different backgrounds who complement each other and produce good discussions, also to ensure that everyone has the necessary preparation and engagement. If you need an answer quickly on enrollment consent, include that in your email.

Course components summary

- Class T, Th 1:30- 3 PM (Office hours TBD)
- Labs (TBD depending on student schedules, requirement 4 or more labs)
- Field trips (requirement to attend 3 or more field trips, max one local)
- Problem sets (2/week, quick problem on Tuesdays, real PS on Thursdays)
- Final group research project & paper (each group must include both science and non-science students)

Field trip notes: Most field trips are scheduled for 8 AM Fridays, to return before lunchtime. For students with unbreakable conflicts, students + TAs can arrange additional field trips for many facilities. There will be at least one trip during reading week as well. U. Chicago will provide transportation (bus + driver) for all "official" trips (Fridays plus alternate trips with large attendance). Signing up for field trips several weeks in advance may be required for those trips that are space-limited. (Facilities cannot always accommodate large groups). We strongly suggest that all students go to Fisk since everyone should see a coal-fired power plant, and will arrange additional alternate "official" trips to Fisk as needed to let everyone have that opportunity. Suggestions of additional field trips are welcome and we have a few potential slots in the last part of the quarter for trips that respond to particular student interests.

The 2011 course website is here <http://geosci.uchicago.edu/~moyer/GEOS24705/2011> and the 2012 course will follow a similar structure.