Many ardently claim that the earth’s nearly seven billion passengers and the energy- and resource-intensive technologies that support us threaten great and irreparable ecological disaster. Global warming, pollution, and reduced biological diversity are taken as overarching threats, on top of mounting stresses on water, energy, soil, forest, and fishery resources. It’s only a matter of time, they say – and the clock is ticking loudly; we’d better change our ways. Others insist with equal passion that this litany just is not so. They say that population will soon drop or level off, that earth can support a far larger population in any case, that worries of running out of (say) oil, or fresh water, are chimerical, and that advanced “green design” technologies are poised to reduce the draw of human society on earth’s living and inanimate resources.

Who is right? We shall explore this surpassingly pressing question through the window of industrial ecology -- the ties connecting the energy, materials, products, and industries of modern civilization with human population and society, and the natural world. We will examine the environmental, energy, economic, historical, and cultural dimensions of the materials and products we use, and of their underlying petrochemical industrial base. We will pay special attention this semester to the environmental consumer -- that is, to the debate about what products are environmentally friendly, and about how much difference ‘environmental shopping’ could make in the first place. Careful study of these cases in turn will shed light on the debate about population, technology, and the environment on national and world scales. We’ll also cover the transformative history of oil and energy in war, transportation, industry, and the home since 1914, and review the raging debate over the future of fossil fuels, their alternatives, and energy policy (carbon credits, 'fracking,' biofuels, gas prices...) in light of demographic and industrial trends around the world. We will explore the prospects for ‘green’ products and energy technologies with drastically smaller pollution and resource impacts, and
envision how advanced materials and 'dematerialization' technologies may revolutionize the way we live in the 21st Century.

Our principal tool for probing these problems will be environmental comparisons of products, materials, technologies, regions, and historical eras. For example, "What's best for the environment: plastic, paper, or ceramic cups? coal or oil? recycled or virgin paper? degradable or non-degradable plastics? natural or synthetic clothing? liquid or gaseous biofuels? local or imported produce? using electricity or avoiding it for various tasks? traditional, ‘organic,’ or industrial agriculture? dense mega-cities or dispersed settlements? more people or fewer people?"

Making such comparisons is very tricky. Seemingly convincing arguments abound on all sides. For example, it is not at all clear that recycling paper saves energy or trees. The first half of the course is devoted mainly to consumption in daily life -- materials, products, and associated practices such as resource conservation, recycling, and wastes. The second half takes up the broad industrial ecology of energy production, transportation, and agriculture, and their connections to population and advanced technologies.

Each student is responsible for a research project: a case study comparing the environmental, energy, demographic, and societal factors associated with two specific products, materials, technologies, regions, or eras. For example, you might decide to make a study of dishwashers versus hand-washing, or synthetic versus 'natural' clothing, or energy savings from electronic commerce compared to regular commerce (i.e., does ordering books online really save energy?), or do the environmental and economic impacts of agriculture depend on whether the same crop (e.g., corn) is grown for food or fuel? All of these subjects raise big "population, technology, and the environment" issues. Or you might compare an exotic or "alternative" product, such as photochromic windows, or composting toilets, with the conventional analogues. Or you can compare the industrial ecologies of New York City, classical Rome, and Machu Picchu, with a view to assessing sustainability and population constraints. Or you can compare competing schools of thought on (say) population trends or global materials flows.

Your research project should not try to cover everything. By the first third of the semester, you should arrive at a concrete, specific "handle" -- for instance, Economic and energy tradeoffs of long-life light bulbs or "Green design" options for 21st century cars or Can organic food feed the world? or Cultural and moral factors in consumption or Mining, metals, and global warming in a sustainable materials economy or Methodological problems in "environmental friendliness" or "carbon footprint" ratings or Debates over the environmental "footprints" of having children or Do appliances really save time and energy overall? or Free-market versus
government regulatory strategies for promoting environmentally-friendly products or Environmental comparisons of laundry products or The Industrial Ecology of the Milk Industry. And so on: as you can see, there's plenty of room for inventiveness. You are encouraged to design an individual topic around the skills of your major or minor. The individual topic can be quite broad in scope or very tightly focused.

The class may form interdisciplinary working teams as appropriate. These could include, for example, an appliance group, a packaging group, a manufacturing group, a transportation group, a sustainable cities group.... Another approach would be for one team to be devoted to energy impacts, another to pollution impacts, a third to regulatory issues, a fourth to economic issues, and a fifth to social, cultural, ethical, and psychological issues.

The main purpose of the teams is brainstorming: suggesting leads, contacts, and analytic approaches that improve each team member's individual research project. Sometimes team members can divide up a big subject -- for example, one person works on environmental regulations affecting the product, another on product engineering history, another on demographic aspects. Team members cooperate in finding and sharing research literature, and information from companies, environmental/energy groups, government agencies, and trade associations.

The course places special emphasis on discovering and "working" the network of experts and advocacy groups bearing on your topic. This means operating as something like a team of investigative reporters, asking how each side on a particular issue responds to the claims of the other sides. As part of your semester-long research project, you are expected to contact individuals and groups actually working in your problem area -- university and national laboratory scientists, industry trade associations, national environmental organizations, Congressional or State legislative committees, government energy and environmental agencies -- and to read their recent key reports and studies. These often are available free.

The course will provide tools for learning how to find these sources. Use of the Internet can be very helpful. The class may decide to set up a reserve shelf for documents and other research materials accumulated by the teams.

Requirements

1. A take-home midterm, handed out _____ [TBA], due in class _____[TBA]. Choose 2 or perhaps 3 essay questions from a list of at least 8. Answers must be typed and double-spaced.
2. A typed, double-spaced final research paper of 12 to 20 pages, due [TBA]. The paper presents the analysis and findings of your individual project. Your paper should display a coherent train of thought, and should, in most cases, analyze the arguments advanced by relevant "stakeholders" (environmental groups, industry associations, regulators, scientists, and so on). Papers are expected to take into account both (1) quantitative and scientific and (2) social, cultural, economic, or ethical aspects of your individual topic. The appropriate balance between (1) and (2) will vary with the nature of the individual topic. The paper also should briefly describe, in an appendix that does not figure in the page count, what you actually did (documents obtained, sources contacted, methods used in any computations).

3. A second take-home examination, based significantly but not exclusively on what is covered in the second half of the semester, on the industrial ecology a sector of modern life (e.g., transportation). Choose one essay question from a list of 3 or more. Answers must be typed and double-spaced. Handed out [TBA], due [TBA].

4. A few one- or two-page written homework assignments. These include two typed two-page status reports on the progress of your individual project. Their format: formal title of topic; capsule description of the scope of the topic; what you have done so far; problems you are encountering; and what you plan to do next. These reports also are given orally and informally to the class, sitting on team panels. The class serves as an informal sounding board: asking questions, making suggestions, offering constructive criticisms. Any other homework will be brief assignments addressing points in the readings or calling for back-of-the-envelope calculations.

5. Supplementary activities as they may arise, such as campus lectures, symposiums, "point-counterpoint" sessions, and energy/environmental conferences. Conferences in particular can help you discover career opportunities.

6. Clear exposition, good grammar, and logical thinking are expected in all written work. Plagiarism will not be tolerated.

Grading

Midterm exam: counts 1/4  Second exam: counts 1/4  Research paper: counts 1/4
Class participation and preparation: **counts 1/4** (includes the short written
homeworks/status reports, oral presentations, contributions to class
discussion, contributions to research team, and attendance; *spotty
attendance will affect your grade.*)

**Readings**

Most readings will be posted online via the Blackboard system, which I
tried out gingerly for the first time last year, torn between environmental
and pedagogical considerations. **However, I'll still require that you each
print out some assigned readings to bring to class for detailed
analysis and annotation.** I'll distribute physical copies of the readings for
the first couple of classes. Other articles and materials will be handed out in
class, too.

**Access**

Professor Sheldon Reaven, Department of Technology and Society and
School of Marine and Atmospheric Sciences. Office hours are in my DTS
office, 343-A Harriman, days and times TBA. Feel free to drop in any time,
however. Phone: 632-8768 or 632-8765. Messages may be left under my
door if I am not in. I’m also available (by appointment) at SoMAS in 147
Dutchess (South Campus), 632-8714.

Teaching Assistant and office hours: TBA