Syllabus: MAE 124/ESYS 103
The Human Earth

Prof. Sarah Gille
Lectures: Tuesday/Thursday 9:30-10:50, WLH 2204
Friday 9:00-9:50, HSS 1330

Professor's office hours: EBUII 473 Tuesday, Thursday, Friday before class from 8:30 until 15 minutes before class. I'm also available in the classroom, before and after class, or by e-mail.
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No scheduled office hours at present. Contact for an appointment.

Course website: http://www-pord.ucsd.edu/∼sgille/mae124

Objectives: This course examines the interaction between human activity and the environment, with a focus on sustainable development. In particular, the course aims to show that it is essential to understand, quantify and embed the environmental dimension (in its broadest sense) at every stage of consideration of industrial and economic activity. The central themes are:

- industry and engineering;
- economics and the effects of governmental interventions in the market;
- energy;
- pollution and waste products.

We focus on fundamental issues rather than detailed technical and scientific analysis. Lectures, homework and exams will be structured accordingly.

Specifically, by the end of the course, you should understand, and be able to discuss:

- the major environmental problems that need to be addressed to ensure sustainable development;
- the central roles played by market forces, technological innovation and governmental intervention;
- engineering and design approaches to take into account, and minimize the environmental impacts of industrial activity;
- environmental aspects of specific industrial sectors, such as energy, transport, land and water use, and the built environment.

Reading:

- Dorf, Richard C. *Technology, humans and society: Toward a sustainable world.* (2001) Academic Press.
- Additional reading may be distributed or made available in electronic form. (This may include articles from books or print media.)

Grading:

- 15% paper 1. (5 pages, due April 27)
- 25% paper 2. (10 pages, due June 1)
- 10% participation.
- 20% midterm (Thursday May 11, in class)
- 30% final exam (Thursday June 15, 8-11 am)
- Late assignments will not be accepted.

Schedule

- Fundamentals of sustainable economic activity (Lectures 1-4):
  - — Definitions of sustainability;
  - — Quality of life;
  - — Concept of the triple bottom line/3Es of Economic growth/Environmental quality/social Equity;
  - — Different kinds of capital;
  - — The roles of the market, government and industry;
  - — Visions of future problems of population growth, global warming, and economic development.
- Engineering and design for sustainability (Lectures 5-8)
  - — Design for environment;
  - — Embedding environmental concerns in engineering practice;
  - — The role of technological innovation;
  - — Eco-efficiency through cleaner processes, cleaner products and sustainable resource use;
  - — Appropriate and intermediate technology in development;
  - — Life cycle assessment as a paradigm;
  - — Internal and external costs;
  - — The role of government to address market imperfections;
  - — The conflict between local and global interests.
- Environmental issues in industrial sectors
  - — Energy (Lectures 9-12)

- Different types of energy;
- Renewable and non-renewable sources;
- Regulation and subsidy;
- Problem of global warming;
- Kyoto protocol;
- Electricity crisis.

— Transport (Lectures 13-16)

- Different types of transport, and the influence of the automobile;
- Internalizing costs;
- Fuel cells.

— Land and water use (Lectures 17-18)

- Agriculture/fisheries;
- Role of biotechnology;
- Productivity growth;
- Pollution and degradation;
- Trans-national interactions;
- Future trends.

— Built environment (Lectures 19-20)

- Energy consumption for heating/cooling and lighting;
- Design for local environment;
- Smart materials and control.