

**United States International University**  
**ES 4770/6770. Industrial Ecology**

Professor: David Bainbridge

This course covers concepts and policies associated with environmental aspects of business management and industrial development. Most environmental problems are symptoms of flawed or incomplete markets and inaccurate accounting. Improving consideration of environmental costs and benefits is a critical aspect of more sustainable development. Developing industrial systems that mimic natural ecosystems, and are recycling, with closed resource loops, no wastes, based on renewable energy, will become increasingly important.

This course reviews the foundations and principles of industrial ecology. Emphasis is on applied problems and differences between different industries, businesses and systems of management, and institutional settings. **Industrial ecology** solutions can only be developed with a good understanding of environmental, cultural, and political factors and historical developments. Opportunities for Green entrepreneurship are also examined.

Readings and papers are an important part of this class.

Course objectives

*Provide a foundation for studying and interpreting business management using industrial ecology*

*Develop an awareness of principles of industrial ecology and sustainability.*

*Improve students information and communication skills.*

*Integrate each students personal experiences, cultural background, and skills into the course.*

*Prepare students for subsequent studies and work in environmental management.*

Required texts:

Socolow et al. 1997. Industrial Ecology and Global Change. Cambridge.

IIIIEE and VTT. 1996. Challenges and Approaches to Incorporating the Environment into Business Decisions. Lund, Sweden

Suggested reading:

Hawken, P. 1993. The Ecology of Commerce. Harper Business.

Makower, J. 1993. The e Factor. Times.

ES 2001: Sustainable resource management and ES 2003. Environmental Design are recommended but not required prerequisites.

Week by week

1. Introduction and summary.

Socolow Ch 1-3.

Industrial ecology -- why, what, how, for whom. The transition to a sustainable economy - theory, examples, introduction. A short history of industrial ecology.

2. The nature of the challenge

Socolow Ch 4-6.

Industrialization as a historical phenomenon. The problem of external costs, subsidies, corporate welfare, and governmental policy - a look across several nations. The end of petroleum man.

3. Disruption of the grand cycles Socolow Ch 8,9.

The nature of human vulnerability and disruption of natural cycles. Carbon and nitrogen cycles. The limits of our knowledge, crudely right or precisely wrong. Economic implications of global change - the response from Europe, the US, and the developing nations. Why British Petroleum has adopted an emissions reduction program.

4. Policies and management strategies Socolow Ch 10, 12,13.

Global warming and policy options to reduce emissions of global warming gasses - response from the developed and developing countries. Policy options and assessing environmental policy. The complexity of governance - simple solutions are politically correct but rarely work. Economic and ecological benefits of conservation and efficiency improvements.

5. Industrial ecology in firms Socolow Ch 23, 25, 27.

The value of case studies and interpretation of effects. The cultural, political and environmental setting and what works, what doesn't.

6. Environmental accounting and environmental compliance IIIEE Ch 1.

Accounting tools and methods in industry.

7. Industrial systems and life cycle cost analysis Socolow Ch 24, 26, IIIEE Ch 2-3.

Systems interactions, biometrics, life cycle assessment.

Policies to encourage clean technology. A look at the energy sectors of several countries and states.

9. Making the future work. Socolow Ch 36. IIIEE Ch 6.

Green industry around the world, by-passing the smokestack industrial era.

Assignment deadlines - automatic deduction if late unless I am notified in advance.

|                                |    | <u>percent of grade</u> |
|--------------------------------|----|-------------------------|
| #1 RESUME DUE                  | 5  |                         |
| #2 PAPER ONE DUE (2 pages)     | 10 |                         |
| QUIZ #1                        | 10 |                         |
| #3 PAPER TWO DUE (2 pages)     | 10 |                         |
| QUIZ #2                        | 10 |                         |
| #4 BIG PAPER DUE (10-15 pages) | 30 |                         |
| #5 PRESENT papers, wrap-up     | 5  |                         |
|                                |    | 20                      |

**Assignment #1. RESUME due**

A resume is critical part of your professional tool kit. It can be difficult to find a good job without a good resume. This is a paper presentation of yourself, your skills and experience. It

cannot replace essential job skills and work habits--but it must reflect what you know and can do in a clear, concise manner. A resume can't get you the job, but it can help get the interview. This is a general version -- more attuned for academia than business. Find out what the preferred format is for the target company or job you are seeking. Resumes are increasingly computer scanned so don't get fancy, use simple fonts and no color. No bullets and simple layout.

This must be typed, carefully edited and checked.

NAME

STREET OR MAIL ADDRESS PHONE/FAX/E-MAIL

at school at home

(optional, please list home city and country)

EDUCATION: (FINISHED AND PROJECTED)

GOAL ADVANCED DEGREE OR CAREER -- WHAT, WHERE?

CURRENT GOAL -- SUCH AS BA ENVIRONMENTAL STUDIES, USIU 1999

ANY PREVIOUS COLLEGE?

HIGH SCHOOL -- WHERE, WHEN

EXPERIENCE: (WORK, VOLUNTEER, SCHOOL GROUPS)

MOST RECENT FIRST - INCLUDE COMPANY/CITY? RESPONSIBILITIES

ANY PUBLICATIONS AND RESEARCH PAPERS: (FORMATTED AS FOLLOWS)

LAST NAME, FIRST INITIAL. YEAR. TITLE. WHERE PUBLISHED

USE RECENT CLASS PAPERS IF NECESSARY.

FOR EXAMPLE: STEEN, A. AND B., D.A. BAINBRIDGE AND D. EISENBERG. 1994. THE STRAW BALE HOUSE. CHELSEA GREEN, WHITE RIVER JUNCTION, VT 326 PAGES.

TALKS AND PRESENTATIONS: LIST

SCHOOL TALKS, TITLE, PLACE, WHEN

COMPUTER SKILLS: SPECIFY MACINTOSH OR IBM PROGRAMS (SUCH AS MICROSOFT WORD, EXCEL, ETC., YOU SHOULD KNOW A SPREADSHEET AND WRITING PROGRAM.

LANGUAGE SKILLS: READING, WRITING

OTHER SKILLS: (PHOTOGRAPHY AND ILLUSTRATION, DANCE, CONSTRUCTION)

SPECIAL TRAINING: IF ANY

COMMUNITY SERVICE: VOLUNTEER WORK, COMMITTEES, ETC.

MEMBERSHIPS AND ASSOCIATIONS: YOU SHOULD JOIN A PROFESSIONAL ORGANIZATION IN YOUR EXPECTED FIELD OF WORK, STUDENT RATES ARE LOW

TRAVEL EXPERIENCE: (LIST COUNTRIES)

## **Paper Format**

**No cover sheet, no title page, use recycled paper**

All papers should be typed, one and a half or double spaced in 12 point Times or similar font, **1.5 inch margin on the left** and 1 inch margins on all other sides. Typographical errors, spelling mistakes, and poor grammar must be corrected by careful proofreading. Ask a friend to check it.

You should use at least five articles and/or sources for your paper. Although textbooks, newspaper articles, and magazine articles can be useful to get started use professional journals, government documents, and scholarly books as primary source materials for the papers.

IF YOU HAVE QUESTIONS ABOUT ASSIGNMENTS OR EXPECTATIONS, PLEASE CALL 635-4616 OR VISIT MY OFFICE, OR CALL ME AT HOME BEFORE 10 PM. 455-6336.

### **#2. Short Papers number one**

Your first two-four page paper will describe an issue affecting industrial ecology applications within a specific business or business sector, or will examine the ethical responsibility we have to future generations and how industrial ecology should be used to reflect this obligation. These are to include at least 4 references (not all from internet).

### **#3. Short Papers number two**

Your second paper should be on a specific topic or issue in **industrial ecology**, i.e. differences in industrial ecology policy between Brazil and Japan. Or the Greening of the Tourism industry. Industrial ecology in plastics manufacturing. The replacement of wood with recycled plastic composite materials. These are to include at least 4 references.

#### **Notes on references.**

Except in cases where original investigations are done, your paper will be a report on research by others. Be sure to give credit for their thoughts or research. This is done by including the citation in the sentence where you use this information. When you use an investigator's data, state his/her ideas, paraphrase his/her conclusions, or quote him/her directly, cite the reference as follows at the end of the sentence (Altieri, 1995) with no page number reference. This is used at the first use, subsequent sentences don't need the reference.

Magazines and journals provide detailed information on reference and style format for authors, often in the first or last issue of the year. We will use a common style for science and ecology. Give full information on your sources with the formats shown below - **make careful notes in the library or copy the cover/ title page and note library catalog number!** These sources are included at the first use of the information in the paper, listing the author and year at the end of the sentence, as in (Bainbridge, 1995).

The style for this and following papers is to cite your sources by author and year in the text, you do not include the page number(s) where you found the material. For example, if Stacey Williams wrote the source paper in 1996 you would end the statement with (Williams, 1996). If Barbara Friz were co-author on the paper the citations would be (Williams and Friz, 1996). If you were an additional author the citation would be (Williams et al., 1996).

Complete references are included at the end of the paper in alphabetical order. Reference format for papers in this course is as follows:

#### **Books**

Author. Year published. Title. Publisher, place published, pages.

Hartwick, J.M. and N.D. Otewiler. 1986. The Economics of Natural Resource Use. Harper and Row, NY

### **Chapters in Books.**

Author. Year published. Chapter title.  
pages[abbrev. as pp.]. book editor/author.  
Publisher, place published.

Graedel, T. 1997. Industrial ecology: definition and implementation. pp. 23-41. In Socolow, R., C. Andrews, F. Berkhout, and V. Thomas, eds. 1997. Industrial Ecology and Global Change. Cambridge.

### **Journal Articles**

Author. Year published. Title of paper. Magazine name. Volume (issue number): pages (if rare publisher, place published)

Shearman, R. 1990. The meaning and ethics of sustainability. Environmental Management 14:1-8

### **Internet**

Use key phrase from internet source for cite (sdearthtimes, 1997) and full address and date and search engine in references.

for example <http://www.sdearthtimes.com> 7/15-1997 Excite

### **Interview**

person. Year. title, comment. where interviewed.

## **#4. Long Paper**

Your paper should explore one of the following areas:

- a) an environmental system--linkages and interactions, external costs, discount rates and inter-generational transfers, opportunities for industrial ecology.
- b) a business opportunity in environmental management-- making a market better through industrial ecology (this could be a case study for a specific firm).
- c) Economic assessment of possible industrial ecology changes within a specific business or industry
- d) Performance contracting - economic and environmental benefits

Communication is the most important part of business, politics and human interaction. Make it work for you by learning how to write well. The long paper should be well written, carefully proofread and fully referenced. The paper should include a computer data base search and the printout for the search should be attached, and must be properly referenced. This paper should be between 10 and 15 pages in length. It will be graded and returned and you can make revisions based on my comments and return it. The goal is to get these published in magazines and journals.

The Long Paper will usually include:

- An introduction that lays out the issue and opposing views.
- The main body of the paper develops your theme using the appropriate scientific and popular literature (at least 5 different sources, no more than 1/2 from internet).
- The close of your paper should look to the future and contain your assessment of how the issue may be or may not be resolved or improved.
- Literature cited must be carefully checked with formats correct and complete.
- A computer search should be attached, with search language and total number of sources found, known as "hits". A world wide web search may be used, but a data base search through the library is better.

This is a lot to accomplish and will require a careful analysis of the issue and a well crafted outline before you start the paper.

*Do not use footnotes, use direct quotations only when they are essential to your argument. An example is quoting a section of a law or a statement made by someone in a speech. In most instances you should paraphrase the information from your sources, giving credit to authors by citing their paper or book.*

**Assignment #5. Presentation**

Presenting ideas is critical. This short talk can cover any of your papers. Expect to talk for only 5 minutes. Prepare an outline of the key points and use graphic aids -either a transparency or a large chart or display. Your time as presenter is valuable - make sure it counts. More details will be provided in class.