Course Syllabus
Sustainable Housing -- Community, Environment, and Technology Fall 2011

ESPM 3601 (Environmental Sciences, Policy and Management)
HSG 3482 (Design, Housing, and Apparel)
3 credit hours

Course Title: Sustainable Housing -- Community, Environment, and Technology
Days & Time: Tuesday and Thursday, 1:15p – 2:30p
Location: RuttanH B35

Instructor: Bob Seavey
Room 202 Kaufert Laboratory
Office hours: by appointment
Phone: 624-3028
Email: bseavey@umn.edu

Co-instructor: Allen Gooch
Email: gooch002@umn.edu

Course Description
For students interested in sustainable housing, green buildings and the technology required for high performance structures. This course is designed for a broad audience of students. We begin with a section on society and housing, exploring how sustainable housing practices build community. The second phase of this course focuses on the relationship between society and the environment. We explore questions about how community growth has impacted the environment and how natural events impact our communities. Finally, the class concludes with a section on building science: how houses work as a system. In this section, we explore the science and technology required to build high performance houses.

Course Objectives
1. To acquaint and analyze the impact of society on the natural environment and to formulate an ethical framework for evaluating these developments.
2. To understand, in some depth, the various visions and interpretations of sustainability related to society, housing, and the environment.
3. To develop a rigorous framework for assessing the role of technology as it relates to building materials and energy sources for housing.
4. To foster a mindset of reflection and objective evaluation, considering multiple viewpoints, as we consider housing technology and community development.

Reading Materials

The Homeowners Guide to Energy Efficiency
John Krigger and Chris Dorsi

The Bulldozer in the Countryside
Adam Rome

Additional required reading materials will be posted via the University of Minnesota’s Moodle, accessible through myU at http://myu.umn.edu or available online.
Attendance, Participation and Deadlines

Students are expected to be in class and on time everyday. When an absence is unavoidable, it is the student’s responsibility to determine what was missed. Even though this is a fairly large class, respectful group interaction is encouraged. Please share your ideas and be open to learning from one another. Students are responsible for submitting work on time. Late assignments will be down graded.

Grading:
Participation (Attendance and Class Discussion) 10 percent
Exam I 20 percent
Exam II 20 percent
Writing Assignments 20 percent
Group Project -- Poster Presentation 10 percent
Final Exam 20 percent

Final letter grades will be based on straight scale percentages:

<table>
<thead>
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<th>Percentage</th>
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Statement on Climate of Inclusivity

You are expected to be attentive during class, ask questions if you do not understand something, and to offer your opinion. You are also expected to listen respectfully to other students and to me when speaking. Racism, sexism, homophobia, classism, ageism and other forms of bigotry are inappropriate to express in this class.
Statement on Mental Health and Disability Services

If you have any special classroom requirements, please contact one of the offices below. They will work with you and, if necessary, they will contact the instructor to work out the details of any necessary accommodations.

<table>
<thead>
<tr>
<th>Student Academic Success Service and Counseling/Consulting Services</th>
<th>340 Appleby Hall, Mpls</th>
<th>612-624-3323</th>
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</thead>
<tbody>
<tr>
<td>Disability Services</td>
<td>199 Coffey Hall, St. Paul</td>
<td>612-624-3323</td>
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<tr>
<td>Center for Writing</td>
<td>180 McNamara, Mpls</td>
<td>612-626-1333</td>
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<tr>
<td></td>
<td>10 Nicholson Hall, Mpls</td>
<td>612-626-7579</td>
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Use of Student’s Work

Students understand that enrollment in this course grants consent for their work to be selected for inclusion in college or departmental publications (online or in print). Your instructor may select to use your work to represent her/his skills as an instructor in a teaching portfolio (online or in print).

Writing Assignments

The writing assignments for this course consist of two papers. The subject for each paper is any topic you choose from our class sessions. Subjects related to class topics but not discussed are permitted with instructor approval.

Due dates:
Paper number one is due Tuesday, October 18
Paper number two is due Tuesday, December 6

Guidelines for each paper:
- 700 to 800 words
- Two academic sources (follow MLA, Chicago, CBE, or APA style)
- Double spaced
- Submit email versions to Bob Seavey at bseavey@umn.edu and Allen Gooch at gooch002@umn.edu
- Submit one print version to Allen Gooch
- Five-point deduction each day paper is late

Grading criteria:
Relevant topic/adherence to paper guidelines/grammar: 50 points
Thesis statement/organization of paper: 25 points
Appropriate sources for academic paper/proper format and citation style: 25 points

See the Moodle site for this course for information on writing, formatting the paper, and using and citing academic sources.

Course Schedule

This is a general course outline and is subject to change.
Any changes will be announced in class and are each student’s responsibility.

Week 1 Course Introduction (Sept. 6 and 8)
-- Definitions of sustainability

Reading: Provided by Instructor - "Descriptions of Sustainable Housing"
"Sustainable Housing - Introduction"

Week 2 Community (Sept. 13 and 15)
-- Volunteerism: Habitat and Third Sector
-- Wilder/Habitat experience
-- Urban Homeworks: case study
Reading: Provided by Instructor - "Sustainable Communities"

**Week 3** Government Initiatives in Affordable/Sustainable Housing (Sept. 20 and 22)
-- Off-the-grid and eco-villages

Readings from websites: http://www.offthegrid.com
Readings: From Sustainable Community: Learning from the cohousing model Graham Meltzer

**Week 4** Environment and Nature as They Relate to Housing (Sept. 27 and 29)
-- Energy sources and environmental issues
  - Fossil fuels
  - Nuclear power

Readings: From websites: http://www.eia.doe.gov/
             http://www.iea.org/

**Week 5** Renewable Energy for Sustainable Housing (Oct. 4 and 6)

Readings: From websites:
           http://www.eia.doe.gov/
           http://www.iea.org/

**Exam I – October 6**

**Week 6** Concepts of Nature as They Relate to Housing (Oct. 11 and 13)
-- Environmental footprint for housing
-- Historical perspective: suburbia and sprawl
  Readings: From The Bulldozer in the Countryside Adam Rome

**Week 7** Water Resources and Housing (Oct. 18 and 20)
-- Building near water: flood plains/lakes and rivers
-- Municipal water supply
-- Septic issues and water treatment after usage

Readings: From The Bulldozer in the Countryside Adam Rome

**First Paper Due – Tuesday, October 18**

**Week 8** Environmental Evaluation of Building Materials (Oct. 25 and 27)
-- Evaluation criteria
  - Cost/benefit
  - Embodied energy
  - LCA
-- Wood, concrete, steel, plastics

Readings: From Website:  http://www.dovetailinc.org/
Reducing the Embodied Energy of Buildings
Tracy Mumma, Home Energy Magazine

**Week 9**  Population Growth and Affluence as They Relate to Housing (Nov. 1 and 3)
-- Population growth projections and expansion in the housing stock (US and worldwide)
-- Role of wealth and affluence in housing decisions: basic shelter to Plantation Green

Readings from Website:  http://www.dovetailinc.org/

**Week 10**  Visions of Future Sustainable Communities (Nov. 8 and 10)
-- Smart growth
-- Community vs. property rights

Readings from: Website:  http://www.smartgrowth.org/
http://www.epa.gov/smartgrowth/

**Week 11**  Technology: Introduction to Building Science (Nov. 15 and 17)
-- Role of design in sustainable housing
-- Planning and designing the building enclosure

Readings from: *The Homeowners Guide to Energy Efficiency*
John Krigger and Chris Dorsi

**Exam II – November 17**

**Week 12**  Technology/Building Science (Nov. 22)
-- Systems approach to building science
-- Air flow in buildings: as this relates to energy consumption and IAQ

Readings from: *The Homeowners Guide to Energy Efficiency*
John Krigger and Chris Dorsi

**Week 13**  Technology/Building Science (Nov. 29 and Dec. 1)
-- Interactions of building design and building systems
-- Planning for high performance buildings: Net-zero and passive houses

Readings from: *The Homeowners Guide to Energy Efficiency*
John Krigger and Chris Dorsi

**Week 14**  Retrofits of Existing Houses (Dec. 6 and 8)
Challenges and opportunities in weatherization
Strategies for the most cost-efficient approach
How much benefit is possible, and at what cost?

Readings from: The Homeowners Guide to Energy Efficiency
John Krigger and Chris Dorsi

Second Paper Due – Tuesday, December 6

Week 15 Course Review and Wrap-Up (Dec. 13)
Performance criteria for evaluation progress
Challenges working with people, populations, and markets as we seek a more sustainable vision for the future
Visions for a building industry, a community planning and homeowner awareness based on building science principles and sustainable practices

Poster Presentation -- Tuesday, December 13

Final Exam Time and Date: 1:30 p.m.-3:30 p.m. Saturday, December 17

Liberal Education

ESPM 3601/HSG 3482 is approved for the Technology and Society Theme. This is part of the Liberal Education requirements at the University of Minnesota. The value of the Liberal Education courses is that they provide a perspective and context beyond the focus of your major. It is important to understand that a University education is more than specialized training in narrowly focused topics. Rather, this education should be a catalyst for a long pathway of continuing, lifelong education. Moreover, the Liberal Education is an opportunity to appreciate different perspectives for a greater understanding of the many challenging issues that graduates in the 21st century will encounter.

Student Learning Outcomes

1. Can identify, define, and solve problems

Students should be able to identify and describe problems and opportunities related to new technological developments in housing. These developments could be related to new building materials, building designs, or energy systems as they relate to housing.

Evaluation:

In the course exams, students will be provided with examples of new technology.
They will need to evaluate the implications of this technology as it relates to energy, consumption, building durability, and occupant health.

2. Can locate and critically evaluate information

As part of the technical poster presentation, student groups will be required to identify at least four technical publications. They must evaluate these sources. They will then be required to include these sources in their poster presentation.

Evaluation:

Grading of the poster presentations will be conducted by faculty and professionals with a background in housing and building science. The evaluation protocol will assess the technical understanding of the material, the technical publications and the interpretations of this information, as well as the relevance and insightfulness of the poster presentation conclusions.

4. Understanding diverse philosophies and cultures within and across societies

Housing issues bring together conflicting and diverse forces in society. Many citizens want "the American dream" -- a sustainable, efficient, affordable home, along with quiet streets, green space, and short commutes. However, developers strive to provide these homes with the most cost-efficient means possible. Often there are environmental consequences such as sprawl and altered ecosystems. These consequences diminish the quality of the homeowner's lifestyle.

Evaluation:

Class discussion periods will focus on the diverse philosophies and viewpoints related to housing and development. Student groups will be asked to represent these divergent positions as part of the discussion. This will constitute part of the student participation grade.

7. Have acquired skills for effective citizenship and life-long learning

Good stewardship of the environment is good citizenship. A home, as shelter, is a fundamental need, and it is a laboratory for the exploration of humans' impact on the environment. Our homes are also a symbol of our lifestyles and consumption habits. There is a need to reflect on the most ethical ways that we can use our technology for the development of sustainable communities within the greater natural environment. Moreover, as technologies change and environmental and social consciousness evolves, there is an increasing need to embrace the tenets of life-long learning, especially after graduation and the completion of the university education. [We have the technology to build roads to most anyplace, flatten mountains, and fill in wetlands, but how can we use this power in the most responsible (ethical) way to have the least impact on the natural world?]
Evaluation:

The format for the exams and the requirements for the technical poster presentation stress the role of technical innovation and good stewardship as responsibilities or good citizenship.

Technology and Society Theme

Advances in the technology used in housing, both materials and design processes, have had a significant impact on the houses and communities in recent years. Currently we are able to build houses faster and cheaper than in past times. We can build in more remote landscapes and can remake the landscape to suit our housing objectives (for better or worse...). Unfortunately, these technological advances have not uniformly led to better houses or better community development. Thoughtful consideration of the technology and the implications of this technology are certainly appropriate.

It is important that students become aware of the technological advancements related to housing: their impact on the housing industry and their opportunities (some realized and some not...), as well as the problems caused by these technological advancements (filling in wetlands, building on floodplains). There is a need to reflect on the most ethical ways that we can use this technology for the development of sustainable communities within the greater natural environment. [We have the technology to build roads to most anyplace, flatten mountains, fill in wetlands, but how can we use this power in the most responsible, (ethical) way to have the least impact on the natural world.]

Developments in building materials and building technology provide us with the opportunity for housing that is energy-efficient, durable and very healthy for occupants. The promise and opportunities are very real. However, the delivery of new and remodeled houses is problematic: builders and developers as well as the housing market have not come together to demand and define this product. Moreover, the human factors related to the management of the house are uncertain: maintenance, living habits, and management practices are undefined and not uniform.

The housing boom following WWII was facilitated by significant technological advancements in the earthmoving equipment as well as the manufacturing process of homebuilding. Looking back at this suburban growth, it is important to be thoughtful and reflective of the role that technology played (good & bad) to make this development happen. Clearly the housing crisis following WWII was solved and the affluence and comfort of the post-war generation has benefited by this development. At the same time, the benefits and disadvantages of suburban sprawl are still debated.

As well as understanding the societal context of recent housing technology developments, it is also important for students to learn a more in-depth appreciation for some of the basic scientific and engineering factors that are critical to drive the advancement in more energy efficient, more structurally sound, and more durable housing. Resistance to hurricanes, cold weather, or driving rain does not result from simply thicker walls and
roofs, rather, these advancements are engineered into the product based on scientific principles and product testing.

**Courses must meet these criteria:**

The course examines one or more technologies that have had some measurable impact on contemporary society.

*Advances in insulation and air sealing to save energy and increase durability will be assessed. These advances have caused a fundamental change in the technology for building houses as well as the homeowner expectation of the performance of newer houses.*

The course builds student understanding of the science and engineering behind the technology addressed.

*The course will document the development of building science as a discipline and the reliance on the fundamental principles of heat and mass transfer. Based on these scientific developments, the subsequent engineering has led to the building technologies that are currently recommended for new home construction.*

Students discuss the role that society has played in fostering the development of technology as well as the response to the adoption and use of technology.

*Students will learn how the recognition, by society, of energy shortages and the concerns about occupant health and building durability have fostered the analysis/research that has led to the technological developments critical to building science.*

Students consider the impact of technology from multiple perspectives that include developers, users/consumers, as well as others in society affected by the technology.

*This course also looks at the sources for energy used for our homes and society. To satisfy this requirement, students will examine the technology required for energy extraction (fossil, nuclear and renewable fuels). They will consider new technological developments (mining tar sands and carbon sequestration) and the choices that society must make about these developments.*

Students develop skills in evaluating conflicting views on existing or emerging technology.

*Students will evaluate the types of renewable energy technology that are being developed for homes and businesses. They will also assess the role of energy conservation and the technology required for energy conservation. They will consider the short-term and long-term implications of adopting this technology.*

Students engage in a process of critical evaluation that provides a framework with which to evaluate new technology in the future.

*With the development of new products as well as new technologies, it is critical to use a disciplined and unbiased system to evaluate the long-term implications. Students will consider these types of analysis: cost/benefit analysis, encumbered energy, and life cycle analysis, as ways to make these evaluations.*