

Urban Planning 494: Sustainability and the Built Environment

Proposed term: SP 2010

Instructors: Brian Deal, Suhail Barot; Department of Urban and Regional Planning

Credits: 4 Hours

Prerequisite: Upper Level Undergraduate or Graduate standing

Course Description

Our existing building stock in Illinois represents approximately 40% of our total GHG emissions while demanding about 75% of our electrical production. At the University of Illinois, they play an even bigger part – buildings here represent over 80% of our GHG footprint. From another perspective, the cultural memory of this campus and more broadly of our civilization, is embedded in our buildings and physical environment. We seek to create a class on the built campus environment, especially related to sustainability and planning for carbon neutrality. We intend to use campus buildings as a learning laboratory, where students can truly engage with the material they learn on the ways we use our buildings and the ways we can improve upon them.

Clearly, any path toward a more sustainable future will need to address strategies for buildings that include vast improvements in efficiencies and approaches toward self support through renewable energy systems. Technologies for both these strategies already exist, although we have been slow to engage students in their discovery, analysis and implementation. . Students in this course, to be offered by Professor Brian Deal of the Department of Urban and Regional Planning, will study the campus buildings, their histories and designs, their past and present uses and place in our campus, and most prominently how they can become more sustainable. Student teams will each focus on a campus building, and collect together information about the building, the people that have used it, the circumstances surrounding its creation, its design, materials, embodied energy, and its broader value to our Campus. Building on this, they will examine the building's energy consumption in detail, correlating it with how people use the spaces, and then finally develop a comprehensive plan to reduce the building's energy consumption, and make it more sustainable – in GHG emission terms. The course will provide them with the tools and resources to accomplish this, teaching them about our campus, about building designs and standards, past and present, about how buildings function as systems, and about how to conduct energy audits.

Furthermore, we intend to partner with the Ethnography of the University Initiative (EUI, <http://www.eui.uiuc.edu/>). For eight years, EUI has been sponsoring courses (circa 15/semester) in which students conduct research on various aspects of the University of Illinois, from the academic curriculum to diversity issues and residential life, to the university as an employer and local institution and so on. EUI is also a robust digital collection of research process/findings documents of U of I students housed in the U of I's digital repository, IDEALS (<https://www.ideals.uiuc.edu/handle/2142/755>) (The EUI collection now has nearly 1000 entries and is the most popular go-to site in IDEALS). We are excited to launch the EUI Buildings and Sustainability Collection, namely a collection of student research documents about some aspect of campus buildings and sustainability. To date, EUI's other collections (e.g., diversity, student learning, technology and student life), have played an important role in fostering targeted student research that builds on already archived work. Further, the proposed offering will result in a training module to be offered at the annual EUI Summer Workshop (the week after the spring semester) for faculty who plan to teach with the project. Faculty will be introduced to research on buildings and campus sustainability and will be encouraged to think about how to adapt these issues to their own disciplinary and curricular specificities. We can imagine that some EUI courses that will take on issues of material and energy infrastructure, some the non-built natural environments of the University, and others that will interrogate the sustainability-related behaviors and beliefs of various campus constituents.

Development of this course also offers significant opportunities to reduce the campus's carbon footprint. The University of Illinois is a signatory to the American College & University Presidents' Climate Commitment; likewise sustainability is a centerpiece of the Campus Strategic Plan. While the first draft of the plan is complete, it will need significant revision in the next two years, followed by continual updates. An additional benefit of this course is that it will develop a detailed knowledge of each building – not just about conservation solutions, but also about why that building uses energy, how the people within it behave, and how it was originally built. This information can feed into the plan to help us develop more realistic goals and strategies for reducing energy consumption in our campus buildings. Additionally, after

students audit their buildings, they will professionally document their work, and present it to energy professionals, whose critiques will also be recorded. This material will be provided to campus energy conservation staff, to assist them in deciding where to focus scarce energy conservation investments. Simultaneously, it will give those students highly marketable experience, and an end product for their portfolios.

Learning Philosophy

The course involves reading, classroom learning and outside applications. Some of the required reading and discussions will be led by students. Participatory learning is essential and stressed.

Course Organization

The course is organized into 8 major themes that revolve around understanding sustainability from a buildings perspective. These include:

1. Sustainability and the Built Environment
2. Building Designs – Past and Present
3. Energized Systems (HVAC, Lighting, Controls, IT, Energy Sources)
4. Non-Energized Systems (Envelopes, Fenestration, Materials, Passive Systems)
5. Building Use and Survey Methods
6. Energy Planning
7. Energy Auditing
 - o Building modeling
 - o Sensors
 - o Financial Analysis,
 - o Field Inspections
8. Case Studies
9. Semester Projects

Each section contains readings that are meant to give the student a basis for understanding these issues in some detail. Each student will write 3 short response papers after we discuss the readings from each of these sections, and a final research paper and presentation on a building or piece of the University (as described) that is relevant and of interest to the student. At the end of the semester we will spend some time specifically discussing how the issues we have examined in the course relate directly to planning practice.

Timeline

To develop the course, we will need to prepare presentations, obtain access to information for the ~5 buildings that our students will engage with, arrange for certain guest lecturers, and arrange to borrow field equipment (thermal cameras, blower door, sensors, and more). This work can be completed in the summer/fall of 2010. After the initial setup, we anticipate the ability to offer this course in an annual basis. We seek to develop the course over the Fall 2010 semester and offer it in the Spring 2011 semester. The proposal, as submitted, also leverages a grant request being made to the Provost's Teaching Advisory Board (PTAB).

Budget

ECI/SSC funds are requested for a Spring 2010 teaching assistant to guide the student teams, teach students how to use energy modeling software, provide field training in energy auditing, supervise access to building systems and use of laboratory equipment, and seek out resources that students have difficulty obtaining. After the course, the TA will work on archiving course materials into IDEALS, and providing student developed materials to campus facilities staff.

Teaching Assistant (PhD Planning student 5 months: @ 33% time) = \$7,000 (if possible)
If PTAB funds are unavailable, we will ask to redirect funds for course development instead of course support, and scale back certain aspects of the proposal.

BRIAN DEAL

Academic Position

- 2005-pr Assistant Professor, Department of Urban and Regional Planning, University of Illinois at Urbana-Champaign.
- Director SmartEnergy Design Assistance Center. <http://www.sedac.org>
 - Director LEAM Modeling Laboratory. <http://www.lead.uiuc.edu>
 - Director of Research at Allerton Park. <http://www.continuinged.uiuc.edu/allerton/>

Outstanding Achievements

- 2006 Research Project of the Year, Department of Defense, Strategic Environmental Research and Development Program, 2006
- 2008-11 Honorary Scientist, Republic of Korea Rural Development Administration

Books Authored

- Deal, Brian. 2008a. *Sustainable Land-Use Planning: The Integration of Process and Technology*. Saarbrücken, Germany: VDM.

Selected Book Chapters

- Deal, B, and Z Sun. 2006b. A Spatially Explicit Urban Simulation Model: Landuse Evolution and Impact Assessment Model (LEAM). In *Smart Growth and Climate Change: Regional Development, Infrastructure and Adaptation*, edited by M. Ruth, 181-203. Northampton, MA: Edward Elgar.
- Deal, B, V Pallathucheril. 2009a. A Use-Driven Approach to Large-Scale Urban Modeling and Planning Support. In *Planning Support Systems: Best Practice and New Methods*, edited by S Geertman and J Stillwell, 29-51. New York, NY: Springer.
- Deal, B, E Jenicek, W Goran, N Meyers, and J Fittipaldi. 2009b. A Strategic Sustainability Assessment. in *Societal Challenges and GeoInformatics*, edited by L Gundersen, D Arctur, J Ian, and K Sinha. Washington, DC: GSA Publishing.

Selected Journal Articles

- Deal, B, and V Pallathucheril. 2009c. Sustainability and Urban Dynamics: A Determination of Development Stress on Local Resources. Forthcoming in *Sustainability Journal*. June 2009.
- Sun, Z, B Deal, and V Pallathucheril. 2009d. The Land-use Evolution and Impact Assessment Model: A Comprehensive Urban Planning Support System. Forthcoming, *URISA Journal*.
- Deal, B, and A Chakraborty. 2009e. Cyber-physical Planning Support Systems: Advancing Participatory Decision Making in Complex Urban environments. Forthcoming, *International Journal of Operations and Quantitative Management* Aug/Sep 2009).

Selected Lectures

2006. Dynamic Spatial Modeling of Complex Urban Systems. National Center for Smart Growth Research and Education. University of Maryland. College Park, MD. Nov.
2007. Use-Based Dynamic Modeling. Lincoln Institute. Cambridge, MA. Sept.
2008. What Would Daniel Do?...with Regional Dynamic Spatial Models. APA Metro. Chicago, IL. Nov.
2008. The Future of Sustainable Landuse Planning. USEPA Brown to Green. Kansa Sate University. Manhattan, KS. Sept.

Related Grants

- Deal, B, PI, with D Fournier. The Illinois Smart Energy Program. The US Department of Energy, IL Department of Commerce & Economic Opportunity. 2005-pr. (multiple contracts).

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Suhail Barot
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Education

University of Illinois at Urbana-Champaign

- PhD, Urban and Regional Planning Expected Graduation: May 2012
- Masters of Science in Electrical Engineering GPA: 4.00 / 4.00 May 2009
- Bachelors of Science in Electrical Engineering GPA: 3.96 / 4.00 August 2006

Academic Honors:

- University Honors – Bronze Tablet (Top 3% of Graduating Class) and Departmental High Honors Recipient.
- Selected for Senior 100 Honorary from the Class of 2006
- Deans List (Undergraduate) – Fall 2003, Spring 2004, Fall 2004, Spring 2005, Fall 2005, Spring 2006

Work Experience - Department of Electrical Engineering at University of Illinois

Research Assistant in Antennas Group, Advisor: Professor Jennifer T. Bernhard September 06 – Present

Teaching Assistant, Grader and Lab Instructor in the Department of ECE January 2005 – Present

- Classes: Introduction to Quantum Electronics for Electrical Engineers
Microwave Devices and Circuits Lines, Fields and Waves
Analog Signal Processing Antennas
- Experience: Gave weekly lectures, graded assignments, prepared HW solutions, held office hours, wrote exam problems, led lab sections in constructing an AM receiver

Campus Sustainability Activities

Student Sustainability Committee (SSC), Chair: September 2008 - Present

- Managed a joint committee of students, faculty and facilities staff tasked with allocating \$550,000 of student fees annually for sustainability projects, through a competitive campus-wide request for proposals.
- Led approval of 23 projects funded by \$1.3 Million of SSC funds, and exercised oversight.
- Assisted in development and submission of four proposals for funding to the Illinois Clean Energy Community Foundation – received a grant for \$225,000 for LED lighting at the Performing Arts Center
- Created new funding program, offering zero-interest revolving loans for energy efficiency projects.
- Worked to prepare and implement proposals, and navigate through challenging institutional structures
- Co-lead for referendum campaign to double the campus environmental fees, to complete more projects.

Chancellor's Sustainability Council, Member April 2009 - Present

- Helped set policies, provide student input on, and support new campus programs related to sustainability.

Illinois Climate Action Plan, Co-author: October 2009 - Present

- Wrote energy conservation section, detailing strategies for 60% reduction in campus building energy use
- Analyzed impact of emissions sources such as University's power plant, the BlueWaters supercomputer (the fastest supercomputer in the world), and analyzed solar energy potential for campus
- Assisted development of strategies and drafting for energy generation, growth mitigation and green building sections
- Presented plan to the Chancellor's Sustainability Council and in public forums

Students for Environmental Concerns, Treasurer May 2009 - Present

- Helped plan and implement campaigns for campus wind turbines, cap-and-trade legislation and against coal use at the University's power plant
- Obtained funding for four off-campus speakers and planned a "Food, Place, and Sustainability" film series
- Helped start new Composting and Weatherization programs and win Clinton Global Initiative grants

Extra-Curricular Activities

Engineers Without Borders – UIUC Chapter: Vice President, Treasurer and Outreach officer 2006-2009

Vis-à-Vis: High school tutor in Math / Physics 2003 - 2009

Krannert Center for the Performing Arts: Usher Supervisor, Usher and Tour Guide 2004 - Present

YMCA of the University of Illinois: Member, Board of Governors and Student Board Treasurer 2008 - Present

UNIVERSITY OF ILLINOIS
AT URBANA-CHAMPAIGN

Department of Urban and Regional Planning

111 Temple Buell Hall
611 Taft Drive
Champaign, IL 61820



Environmental Change Institute
University of Illinois

12 March 2010

RE: Letter of Support for UP 494: Sustainability and the Built Environment

This is a letter of support for the proposed development and teaching of a new course on Sustainability and the Built Environment in our department. We think the subject is important and relevant for our department, the content is good, and the connections it makes to other units on campus are important.

We fully support this course proposal.

Sincerely,

A handwritten signature in black ink, appearing to read 'E. Feser', written in a cursive style.

Edward Feser
Professor & Head