

Sustainability in Action: Cal Climate Action Course

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Date/time: Tuesdays 4-7pm, Mulford 106

Expected number of students: 15

Course summary:

In 2007, the Cal Climate Action Partnership (CalCAP) plan was approved by the UC Berkeley administration. This plan commits the campus to reducing campus greenhouse gas emissions to 1990 levels by 2014, six years earlier than other campuses in the UC system.

This represents a significant challenge for the University, but also an opportunity for students to both learn and contribute to change. Through this interdisciplinary course, students will learn about the wide range of topics and tactics that fall under the umbrella of “sustainability”. This course will provide motivated students an opportunity to contribute to significant reductions in campus greenhouse gas emissions and the realization of longer term sustainability goals. Course sessions will engage CalCAP contributors, facilities management, research faculty, and the UC Berkeley administration in conversation on specific campus sustainability projects and additional opportunities for emissions reductions on campus. The concepts learned in the classroom will be applied through individual or group student research projects.

Course details:

This is a 2 unit class addressing both theoretical and practical aspects of campus sustainability. The course is interdisciplinary, incorporating concepts from business, engineering, public policy social sciences. Projects will be defined based on student interest. The course will incorporate 2 hours per week of lecture, followed by an hour of project discussion when necessary.

Grading will be based on:

- Class Participation (10%)
- Midterm Presentation (30%)
- Final Presentation / Report (50%). Final paper topics must have practical applications and directly relate to CalCAP’s goal of reducing emissions on campus.
- 2 Short Assignments (10%)

Course Schedule with Readings

Note: Readings listed under each week must be read before class that day. Speakers and readings are subject to change. Readings will be posted on bspace, unless link is provided.

1/19/10 Course introduction & Intro to sustainability at Berkeley

Confirmed guest lecturers: Sam Borgeson (Energy and Resources Group), Kira Stoll (Office of Sustainability)

1/26/10 UC Berkeley sustainability initiatives, institutional structure, and green buildings

Confirmed: Lisa McNeilly (Office of Sustainability), Judy Chess (Department of Capital Projects)

READINGS:

- 2007 CalCAP feasibility study (44 pp)
- 2009 Climate Action Plan (28 pp)
- Familiarize yourself with UC Berkeley's sustainability website (<http://sustainability.berkeley.edu>) and the CalCAP website (<http://sustainability.berkeley.edu/calcap/>)
- UC Berkeley building budget process/approval roadmap: http://www.cp.berkeley.edu/FS_Info/pa-betaweb/main.htm

Assignment:

Find a policy at another university related to climate change or emissions reductions, and email an analysis (~250 words) of its strengths and weakness to ckunkel@berkeley.edu **by 5pm January 24th**. These will be shared with the class. Possible resources to start:

- <http://www.greenreportcard.org/report-card-2009/awards/campus-sustainability-leaders>
- <http://www.nwf.org/campusecology/resources/yearbook/>
- <http://greencampus.harvard.edu>
- <http://sustainablestanford.stanford.edu>

2/2/10 Discussion of possible student projects

READINGS:

- 2007 CalCAP course report (90 pp)

Assignment

Write a preliminary description of the research you would be most interested in doing to further sustainability goals on campus (~250 words), and email to ckunkel@berkeley.edu **by 5pm January 31st**.

2/9/10 Waste & recycling

Confirmed: Lisa Bauer (Manager of Campus Recycling and Refuse Services), Sintana Vergara (Energy and Resources Group)

READINGS:

- <http://sustainability.berkeley.edu/pages/waste/overview.shtml>
- Kshetry, Vergara, and Burt, "The Potential for Biogas Generation from Wastewater and Solid Waste on the UC Berkeley Campus," December 2008.

2/16/10 Energy system basics

Confirmed: Catherine Wolfram (UC Energy Institute)

READINGS:

- Masters, G. (1991) *Introduction to Environmental Engineering and Science* (Prentice Hall: NJ), pages 15 – 29
- Wikipedia article on NPV, http://en.wikipedia.org/wiki/Net_present_value
- Wikipedia article on IRR, http://en.wikipedia.org/wiki/Internal_rate_of_return

Optional:

- Russo, Christopher. "Using Real-Time and Historical Data Through the Internet and on the Desktop" <http://cogen.mit.edu/publications.cfm>
- Cengel, Y. A. and Boles, M. A. (2001) *Thermodynamics: An Engineering Approach* (McGraw Hill: New York), 116 - 122, 240 – 271, 397 – 400.
- Masters, G. (2004) "Wind Power Systems." *Renewable and Efficient Power Systems* (Wiley InterScience: New York), pages 307 – 354.
- Masters, G. (2004) "Photovoltaic Materials and Electrical Characteristics." *Renewable and Efficient Power Systems* (Wiley InterScience: New York), pages 445 – 463

2/23/10 Co-generation and Berkeley's steam system

READINGS:

- EPA, "Gas Turbines", 2008:
http://www.epa.gov/chp/documents/catalog_chptech_gas_turbines.pdf
- EPA, Basic Information on Combined Heat and Power,
<http://www.epa.gov/chp/basic/index.html>

Optional:

- Marnay, et al (2007), "Optimal Technology Selection and Operation of Microgrids in Commercial Buildings." <http://eetd.lbl.gov/EA/EMP/reports/62315.pdf>

3/2/10 Buildings: Energy Efficiency & Building Envelope

Confirmed: Raul Abesamis (UC Berkeley Department of Physical Plant), Steve Selkowitz (Lawrence Berkeley Lab)

READINGS:

- D. Goldstein, "Extreme Efficiency: How Far Can We Go If We Really Need To?", ACEEE Summer Study on Energy Efficiency in Buildings, 2008
- UC Strategic Energy Plan, 2008 [at least Executive Summary & Introduction]
- Mathew, P. et al. "Rating energy efficiency and sustainability in laboratories: Results and lessons from the Labs21 program." Conference: ACEEE 2004 Summer Study in Buildings, 2004.

Optional:

- Torcellini, P., S. Pless, M. Deru, B. Griffith, N. Long, R. Judkoff (2006). Lessons Learned from Case Studies of Six High-Performance Buildings, NREL.
- Kats, G. H. (2003). "Green Building Costs and Financial Benefits." Published in USA for Massachusetts Technology Collaborative. <http://www.cap-e.com/ewebeditpro/items/O59F3481.pdf>

3/9/10 Building operations & commissioning

Confirmed: Patrick MacArdle (Department of Capital Projects), Cris Benton (Architecture)

READINGS:

- E. Mills et al, "The Cost-Effectiveness of Commercial-Buildings Commissioning", Lawrence Berkeley National Laboratory, 2004.
- Darby, S. (2006). "The Effectiveness of Feedback on Energy Consumption", A Review for DEFRA of the Literature on Metering, Billing and direct Displays.
- Lutzenhiser, L. (1993). "Social and Behavioral Aspects of Energy Use." Annual Review of Energy and the Environment 18: 247-289.

3/16/10 Mid-term presentations

3/23/10 Spring break

3/30/10 Behavioral economics and behavioral modeling

Confirmed: Joan Walker (CEE)

4/6/10 Sustainable Transportation & incentives

Confirmed: Susan Shaheen (Transportation Sustainability Research Center), Derek Lemoine (Energy and Resources Group)

READINGS:

- <http://sustainability.berkeley.edu/pages/transportation/overview.shtml>
- Shaheen et al., "North American Carsharing Market: A 10-year retrospective." 2009 Transportation Research Board Annual Meeting, August 1, 2008.
- Shaheen et al., "Bikesharing in Europe, the Americas, and Asia: Past, present, and future." 2010 Transportation Board Annual Meeting, November 15, 2009.

4/13/10 Water conservation & reuse

Confirmed: Lindsay Franzen (California Public Utilities Commission), Vicki Elmer (City and Regional Planning)

READINGS:

- J. Daniels, "A Sustainable Water Plan for UCB", 2005 (70 pp).

4/20/10 Life Cycle Analysis

Confirmed: David Dornfeld (Mechanical Engineering)

4/27/10 and 5/4/10 Project-focused discussions and presentations