

EE 80S: Sustainability Engineering and Design (Fall 2011)

Lecture time: T Th 10-11:45, Baskin Engineering 152

Lab times: Tu 2-3:10, Tu 4-5:10, F 2-3:10, F 3:30-4:40

Instructors: Katie Monsen (kmonsens@ucsc.edu), Ronnie Lipschutz (flipsch@ucsc.edu), Steve Gliessman (gliess@ucsc.edu), Ali Shakouri (ali@soe.ucsc.edu), Melanie DuPuis (emdupuis@ucsc.edu), Ben Crow (bencrow@ucsc.edu)

TA: Nick Cramer (ncramer@ucsc.edu)

Lab instructor:



Course web site: <https://ecommons.ucsc.edu> (sign in, then look for 22096 LEC 01: EE80S)

Please consult the website for the current and complete syllabus.

Course description: This course is a topical introduction to principles and practices of sustainability engineering and ecological design (SEED) defined here as the planning, development and deployment of technological and social systems and institutions that can protect the earth's ecological systems for this and future generations. The course provides students with an understanding of basic scientific, engineering and social principles in the design, deployment, and operation of resource-based human systems, and how they can be maintained for this and future generations. No specialized background in engineering, sciences or social sciences is required, and the course is open to all students. It is a gateway course to the curriculum in Sustainability Engineering and Ecological Design (SEED).

Course organization and requirements: The course consists of six parts: 1. A series of required lectures on topics relevant to sustainable engineering and design; 2. Weekly lab/discussion sections (required); 3. Required and optional readings linked to topics; 4. Brief weekly in-class assignments on lecture and reading topics and content; 5. A team research project to address a specific problem studied in class (*note three due dates on syllabus, when assignments are due in class*); and 6. A final exam.

Grading: Weekly in-class assignments, 25%; lab participation, 30%; final projects, 25%; final exam, 20%

Texts: There are no assigned texts for this course; all materials are on line under "Resources" on eCommons.

Disability Accommodations: If you qualify for classroom accommodations because of a disability, please submit your Accommodation Authorization Letter from the Disability Resource Center (DRC) to Katie during office hours or by appointment, preferably within the first two weeks of the quarter. Contact DRC by phone at 831-459-2089 or by email at drc@ucsc.edu for more information.

Optional evaluations: Course evaluations are no longer required at UCSC, but may be requested by students. If you wish to receive an evaluation in this course, **you must request it from Katie, either in writing or by e-mail, by October 15.**

Academic integrity at UCSC

By enrolling in the university, students are automatically agreeing to abide by policies, including those on academic misconduct. Academic integrity and scholarship are core values that should guide our conduct and decisions as members of the UCSC community. Plagiarism and cheating contradict these values, and so are very serious academic offenses. Penalties can include a failing grade in an assignment or in the course, or suspension or expulsion from the university. Students are expected to familiarize themselves with and follow citation practices (<http://nettrail.ucsc.edu/ethics/index.html>) and the university's Rules of Conduct regarding student conduct and discipline: <http://www2.ucsc.edu/judicial/handbook.shtml>.

Any test, paper or report submitted by you and that bears your name is presumed to be your own original work that has not previously been submitted for credit in another course unless you obtain prior written approval to do so from your instructor.

In all of your assignments, including your homework or drafts of papers, you may use words or ideas written by other individuals in publications, web sites, or other sources, but only with proper attribution. "Proper attribution" means that you have fully identified the original source and extent of your use of the words or ideas of others that you reproduce in your work for this course, usually in the form of a footnote or parenthesis.

As a general rule, if you are citing from a published source or from a web site and the quotation is short (up to a sentence or two), place it in quotation marks; if you employ a longer passage from a publication or web site, please indent it and use single spacing. In both cases, be sure to cite the original source in a footnote or in parentheses.

You may not copy another student's work or use another student's work as a model. The best way to avoid committing accidental plagiarism is to read a passage in a reference, take notes in your own words after you have closed the reference, and then write your paper from your notes.

Students who submit papers containing plagiarized material or information they did not collect or whose papers are not clearly their own will fail the course and be referred to his/her college provost for disciplinary action. Please be aware that anyone who tries to help a friend by letting him copy his work is also considered guilty of academic dishonesty according to university regulations. If you have any questions about what constitutes unfair collaboration or plagiarism, please contact the instructor. Students who violate the academic integrity policy typically fail the course.

Finally, you should keep in mind that as a member of the campus community, you are expected to demonstrate integrity in all of your academic endeavors and will be evaluated on your own merits. So be proud of your academic accomplishments and help to protect and promote academic integrity at UCSC. The consequences of cheating and academic dishonesty – including a formal discipline file, possible loss of future internship, scholarship, or employment opportunities, and denial of admission to graduate school – are simply not worth it.

If you are uncertain about the expectations for completing an assignment or taking a test or examination, be sure to seek clarification from your instructor or TA beforehand.

Date & topics	Learning objectives & connections	Required reading
<p>Sept 22: Introduction to the course & theme</p> <p>Course Overview (Katie Monsen)</p> <p>What is Sustainability? (Ali Shakouri, Steve Gliessman)</p>	<p><i>Understanding sustainability as a multifaceted “social project”</i></p> <p>Social system, socioscape, ecosystem, ecoscape; roles and limitations of science and technology; sustainability science</p>	<p>Sustainability as a Social Project. Introduction in forthcoming <i>Handbook to Social and Ecological Sustainability</i> (p. 1-28)</p>
<p>Sept 27: Developing the theme: design, projects and labs</p> <p>Course Requirements: Projects, Labs, Effectiveness in Project Teams (Katie)</p> <p>Successful Student Projects (Ben Oberhand, Marisa Gaska)</p>	<p><i>Sustainability & higher ed; why multidisciplinary teams are key for sustainability science; teams as part of the design process</i></p> <p>Design Steps: Labs + Projects UCSC as a bureaucratic institution</p> <p>Weekly lab & section: Product & Packaging</p> <p>Introduction to student projects</p>	<p>A. Coghlan. 2009. Sustainability initiatives at the University of California. <i>AESS Newsletter</i> 2: 12, 36-39.</p> <p>UCSC. 2010. Draft Campus Sustainability Plan 1.0. http://sustainability.ucsc.edu/sites/sustainability.ucsc.edu/files/UCSC_Sust_Plan_4.23.10.pdf</p>
<p>Sept 29: Social issues in sustainability</p> <p>Successful Student Projects, cont. (Jason Daniel)</p> <p>Society, Design, and Practice (Melanie DuPuis)</p>	<p><i>How design affects use & practice, and why this matters; understanding the distinction between individual choice & social regulation</i></p> <p>Personal practices Institutions, change & choice</p>	<p>W. McDonough & M. Braungart. 2002. Ecoeffectiveness. Ch. 3 in <i>Cradle to cradle</i>. North Point Press.</p> <p>S. Kumar & V. Putnam. 2008. Cradle to cradle: Reverse logistics strategies and opportunities across three industry sectors. <i>International Journal of Production Economics</i> 115: 305-315.</p>

Date & Topics	Learning objectives & connections	Required reading
<p>Oct 4: Energy I</p> <p>Energy Capture in Biomass and Meat (Steve)</p>	<p><i>Examining alternate ways of producing and capturing energy</i></p> <p>Energy calories & food calories</p> <p>Weekly lab & section: Calculating a C Footprint</p>	<p>Barry D. Solomon. 2010. Biofuels and sustainability. <i>Annals of the New York Academy of Sciences</i> 1185: 119-134.</p> <p>FAO. Biological energy production. Ch. 1 in <i>Renewable biological systems for alternative sustainable energy production</i>.</p> <p>Stock and Flow, at: http://www.seed.slb.com/subcontent.aspx?id=4014</p>
<p>Oct 6 : Energy II</p> <p>Stocks, Flows, Global Energy, and Alternatives (Ali)</p> <p>Energy: A Local Story (Paul Liebenberg)</p>	<p><i>Global energy use and sources; why it is difficult to deploy energy alternatives for reasons of policy, politics & interests</i></p> <p>Energy supply & demand How problems are evaluated Public policy: how is it made Energy regulation Small-scale energy production</p>	<p>Work, energy & power – The basics, at: http://www.edinformatics.com/math_science/work_energy_power.htm</p> <p>David Fridley. 2010. Nine Challenges of Alternative Energy. Post-Carbon Institute. http://www.postcarbon.org/Reader/PCReader-Fridley-Alternatives.pdf</p> <p>D. Sarewitz & R. Nelson. 2008. Three rules for technological fixes. <i>Nature</i> 456: 871-872. http://www.nature.com/nature/journal/v456/n7224/full/456871a.html</p>
<p>Oct 11: Food I</p> <p>The Global Food System & Local Resistance (Eric Holt-Giménez)</p>	<p><i>The social and environmental challenges of a globalized food system</i></p> <p>Food chains Knowledge and power How people who grow food for a living can be malnourished</p> <p>Weekly lab & section: Biofuels 1 & Life Cycle Analysis</p>	<p>Eric Holt-Giménez. 2006. Emergence: Mayan roots, Mexican branches, Nicaraguan fruits. Ch. 1 in <i>Campesino a campesino: Voices from Latin America's farmer to farmer movement for sustainable agriculture</i>.</p> <p>Lucy Jarosz. 2009. Energy, climate change, meat, and markets: mapping the coordinates of the current world food crisis. <i>Geography Compass</i> 3: 2065-2083. http://onlinelibrary.wiley.com/doi/10.1111/j.1749-8198.2009.00282.x/pdf</p>

Date & Topics	Learning objectives & connections	Required reading
<p>Oct. 13: Energy III</p> <p>Solar PV & Case Study: Panoche Valley (Dustin Mulvaney)</p> <p>Greenwharf Project (Tiffany Wise-West)</p>	<p><i>Understanding the politics of energy technology and the politics in energy technologies</i></p> <p>Technology as a solution & as a problem</p> <p>Local examples of alternative energy production</p>	<p>Kari Larsen. 2009. End-of-life PV: then what? <i>Renewable Energy Focus</i>.</p> <p>Matthew Wald. 2011. Solar firm aided by federal loans shuts doors. <i>New York Times</i> Aug. 31, 2011.</p> <p>Union of Concerned Scientists. Clean energy 101. http://www.ucsusa.org/clean_energy/clean_energy_101/ (read “How Solar Energy Works” and “How Wind Energy Works”)</p>
<p>Oct. 18: Food II</p> <p>Agroecology as an Alternate Way of Understanding Food Production (Steve)</p>	<p><i>Looking at food system issues in an ecological context</i></p> <p>Relationship between landscape and society</p> <p>Horizontal and vertical integration</p> <p>Agroecology</p> <p>Weekly lab & section: Biofuels 2 / Solar PV Intro</p> <p> DUE: Project outcomes statement</p>	<p>Molly D. Anderson. 2007. The future of food systems: global to local. University of Massachusetts-Amherst. http://www.umass.edu/tei/TEI_2005/PDF/The_Future_of_Food_Systems022607.pdf</p> <p>Steve Gliessman. 2000. The ecological foundations of agroecosystem sustainability. Ch. 1 in <i>Agroecosystem sustainability: Developing practical strategies</i>. p. 3-14.</p> <p>Steve Gliessman. 2009. College 8 commencement. June 13, 2009.</p>
<p>Oct. 20: Food III</p> <p>Bringing Food Home: Striving for Sustainability in UCSC's Food Service (Tim Galarneau)</p> <p>Multiple Approaches to Sustainable Food: Place-Based Examples (Katie)</p>	<p><i>Challenges of institutional change; unpacking the labels of alternative food production methods</i></p> <p>Food deserts</p> <p>Connecting energy and agriculture</p> <p>Meeting multiple goals in food production</p> <p>Can the world be fed in the future?</p>	<p>David Tilman, et al. 2002. Agricultural sustainability and intensive production practices. <i>Nature</i> 418: 671-677. http://www.nature.com/nature/journal/v418/n6898/pdf/nature01014.pdf</p> <p>Roger Bybee. 2009. Growing Power in an urban food desert. <i>Yes!</i> Feb. 13, 2009.</p>

Date & Topics	Learning objectives & connections	Required reading
<p>Oct. 25: Environmental Ethics</p> <p>From Conservation to Environmentalism: Aldo Leopold and the Idea of Sustainability (Bruce Thompson)</p>	<p><i>Tracing the roots of modern environmentalism</i></p> <p>Limits to growth</p> <p>Weekly lab & section: Solar Demo (at the Sustainable Living Center)</p>	<p>Aldo Leopold. 1949. The Land Ethic. <i>in</i> The Sand County almanac. Oxford University Press.</p> <p>Robert Heilbroner. 1972. Growth and survival. <i>Foreign Affaris</i> 51(1): 139-153.</p>
<p>Oct. 27: Water I</p> <p>Global Water (Ben Crow, Katie)</p>	<p><i>How much water is enough and whether water is scarce; water as a right vs. water as a commodity</i></p> <p>Human needs vs. capital Water poverty Embedded/virtual water</p>	<p>A.Y. Hoekstra & A.K. Chapagain. 2007. Water footprints of nations. <i>Water Resource Management</i> 21: 35-48. http://www.springerlink.com/content/t6264j8730051762/fulltext.pdf</p> <p>Your water footprint. http://www.waterfootprint.org/?page=cal/WaterFootprintCalculator (Try calculating your own)</p>
<p>Nov. 1: Water II</p> <p>California Water (Brent Haddad)</p> <p>Where Does Your Water Come from? (Bill Kocher)</p>	<p><i>Who benefits from the California water infrastructure and how much much water California really needs.</i></p> <p>Water diversions Water conservation Water for ecosystems Desalination</p> <p>Weekly lab & section: Coltan 1</p>	<p>David Carle. 2004. The distribution system. pp. 85-131 <i>in</i>: Introduction to Water in California. http://ic.ucsc.edu/~rtipsch/EE80S/Calwater.pdf</p> <p>Santa Cruz Municipal Utilities. 2011. Our current water resource challenges. <i>SCMU Review</i> 51:1,2,8</p>

Date & Topics	Learning objectives & connections	Required reading
<p>Nov. 3: Production & Commodity Chains</p> <p>Production (Ben)</p> <p>Life Cycle Analysis (James Barsimantov)</p>	<p><i>Applying green principles to the production of goods and services; developing LCAs</i></p> <p>Greening industry; greenwashing industry</p> <p>Ecological modernization</p> <p>Where do we bound LCAs?</p>	<p>S. Madival, R. Auras, S.P. Singh & R. Narayan. 2009. Assessment of the environmental profile of PLA, PET and PS clamshell containers using LCA methodology. <i>Journal of Cleaner Production</i> 17: 1183-1194.</p> <p>25 big companies that are going green. <i>Business Pundit.com</i> http://www.businesspundit.com/25-big-companies-that-are-going-green/</p>
<p>Nov. 8: Consumption & Waste</p> <p>Consumption & Waste (Ronnie Lipschutz)</p> <p>High Costs of Cheap Clothes (Katie)</p>	<p><i>What drives the supply of and demand for non-subsistence needs</i></p> <p>Sustainability & consumption</p> <p>Measuring impact</p> <p>Reproducing social practices</p> <p>Planned vs. perceived obsolescence</p> <p>No lab this week (holiday)</p> <p>👋 DUE: Proposal rough draft</p>	<p>Ronnie Lipschutz. 2003. Capitalism, globalization & the environment. ch. 3 in <i>Global Environmental Politics: Power, Perspectives, and Practice</i>.</p> <p>“The Story of Stuff,” at: http://www.storyofstuff.com/</p> <p>Adam Aston. 2011. Patagonia takes Fashion Week as a time to say “Buy Less, Buy Used.” <i>GreenBiz.com</i> http://www.greenbiz.com/blog/2011/09/08/patagonia-takes-fashion-week-time-say-buy-less-buy-used</p>
<p>Nov. 10: Cities I</p> <p>Design & Planning (Hilary Nixon)</p>	<p><i>General geographic, economic & political circumstances underlying establishment of a city; how cities grow; how they specialize</i></p> <p>Comparative advantage</p> <p>Urban planning & design</p> <p>Embedded resources</p>	<p>Thomas Daniels. 2009. A trail across time: American environmental planning from city beautiful to sustainability. <i>Journal of the American Planning Association</i> 75(2): 178-192.</p> <p>City of Santa Cruz. 2010. Sustainable transportation and land use planning. Ch. 5 in <i>Draft Climate Action Plan</i>.</p>

Date & Topics	Learning objectives & connections	Required reading
<p>Nov. 15: Cities II</p> <p>Automobility as a Technical & Social Problem (Ronnie)</p> <p>Getting around UCSC (Larry Pageler)</p>	<p><i>How automobility came into being and alternatives for modification and replacement, including at UCSC</i></p> <p>Mobility as a value and right Technological fixes don't work Changing social habits & norms</p> <p>Weekly lab & section: Coltan 2</p>	<p>Peter Freund & George Martin. 2007. Hyperautomobility, the social organization of space, and health. <i>Mobilities</i> 2: 37-49 http://www.informaworld.com/smp/ftinterface-content=a771144817-fulltext=713240930</p> <p>Will Toor. 2003. The road less traveled: sustainable transportation for campuses. <i>Planning for Higher Education</i> 31: 131-41. http://www.secondnature.org/pdf/snwritings/articles/ToorRoad_Less_Traveled.pdf</p> <p>Troy Turner. 2011. Oyster cards get cute. http://www.yankodesign.com/2011/08/01/oyster-cards-get-cute/</p>
<p>Nov. 17: Cities III</p> <p>Building & architecture (Karsten Mueller)</p> <p>Art & environment (Helen & Newton Harrison)</p>	<p><i>Resource inputs into buildings, resource use in buildings, using resources more efficiently in buildings</i></p> <p>LEED Zero-energy homes Alternative building designs</p>	<p>Richard C. Diamond & Mithra Moezzi. 2000. Revealing myths about people, energy and buildings. <i>Proceedings of the 2000 ACEEE Summer Study on Energy Efficiency in Buildings</i>. http://enduse.lbl.gov/Info/LBNL-45862.pdf</p> <p>Charles Lockwood. 2006. Building the green way. <i>Harvard Business Review</i> 84: 129-37. http://summits.ncat.org/docs/HBR_building_green_way.pdf</p>
<p>Nov. 22: Politics & Economics</p> <p>Panel Discussion (Ali, Ben, Ronnie)</p>	<p><i>The intersection between politics, economics, environment, and sustainability: where is the locus for creating societal change?</i></p> <p>Personal responsibility Roles of policy and industry</p>	<p>Gernot Wagner. 2011. Going green but getting nowhere. <i>The New York Times</i> Sept. 7, 2011.</p> <p>Derrick Jensen. 2009. Forget shorter showers: Why personal change does not equal political change. <i>Orion</i></p>
<p>Nov. 24: No class</p>		

Date & Topics	Learning objectives & connections	Required reading
<p>Nov. 29: Sustainability at UCSC</p> <p>Campus goals and programs (Aurora Winslade)</p>	<p><i>How institutions like UCSC can be induced to change</i></p> <p>Bureaucratic stasis, fear and barriers of institutional structures</p> <p>Creative thinking</p> <p>Fostering social innovation</p> <p>Weekly lab & section: Selected student projects</p> <p> DUE: Final project proposal</p>	<p>The College Sustainability Report Card. http://www.greenreportcard.org/ (look up UCSC and at least one other school of your choice)</p> <p>Sustainability Engineering & Ecological Design. http://seed.soe.ucsc.edu/</p>
<p>Dec 1: Sustainability Revisited</p> <p>Synthesis & Overview (faculty)</p> <p>Presentation of Selected Student Projects</p>	<p><i>Revisiting sustainability as a social project</i></p>	<p>Ted Mero. 2011. The value proposition of a sustainable degree. <i>Sustainability Journal</i> 4(3): 113-116.</p> <p>J.R. Fulton. 2011. The built environment - sustainable campus planning. <i>Sustainability Journal</i> 4(1): 22-25.</p>