

Design for Sustainable Communities
Civil and Environmental Engineering 290, CCN 14235, 3 Units
Spring Semester 2009

Instructor:	Professor Ashok J. Gadgil Email: ajgadgil@lbl.gov Office: 661 Davis & LBNL Building 90, Room 3026D Office Hours: M,W 9-10, Location 661 Davis; or by appt.
GSI:	Johanna Mathieu Email: jmathieu@berkeley.edu Office: 6102 Etcheverry & LBNL Building 90, Room 3037C Office Hours: M 11-12, Location 642 Davis; or by appt.
Lectures:	W 10-12, 24 Wheeler
Required Discussion:	M 10-11, 24 Wheeler
Prerequisite:	Graduate standing, or consent of instructor.
Website:	http://bSpace.berkeley.edu
Past projects:	http://eetd.lbl.gov/staff/gadgil/teaching.html

Course Description:

This course provides conceptual and hands-on experience in the design and implementation of innovative products or processes for improving the sustainability of resource-constrained communities (mostly poor ones in the developing countries). Teams of five students each will take on practical projects, with guidance from subject experts. The goal of the projects is to help mature innovations into useful products or processes and to assess social and business opportunities for real-world dissemination of these products. Because these problems are interdisciplinary in nature, we welcome students from a variety of backgrounds, including engineering, physics, environmental science, ERG, architecture, economics, business, public policy, and public health, among others.

Course Outline:

1. Sustainable Development, HDI, MDG
2. Economics: NPV, Discounting, Levelized Costs
3. Human Centered Design Process
4. Diffusion of Innovations
5. Project Case Studies: Successes and Failures
6. Project Evaluation Methods

Readings:

The two books for the course are:

D.A. Norman (1988) *The Design of Everyday Things*

P. Sainath (1992) *Everybody Loves a Good Drought: Stories from India's Poorest Districts* (*Note that there is a glossary of terms on bSpace.*)

Other readings will be available as pdfs on bSpace.

Grading:

Weekly Reflections	10%
Class Participation	5%
Biweekly Reports to the Class	5%
Midterm Presentation	10%
Midterm Progress Report	15%
Final Presentation	20%
Final Report/Team Binder	35%

Reflections on readings and/or classroom discussion should be posted each week (by Tuesday at midnight) on bSpace. Please read other's reflections, and respond or add to, or comment on the points being made. We encourage you to use the reflections as a forum for discussion. Reflections should be about a screen-full of text.

Every other week your team will take < 3 minutes and present the state of your project to the class. This is an excellent time to not only share your successes but also your setbacks and struggles.

After spring break each group will make a midterm presentation (with PowerPoint slides, more formal than the biweekly reports) and submit a short midterm progress report (which will become the basis for your final report). Midterm presentations/reports are not only important pieces of documentation but also these presentations/reports will help to revisit, and potentially revise, your original goals.

Final project presentations will be open to the others outside the class, and we encourage you to invite your mentors. Though the presentations are important, your final report is the most important piece of work you will produce for this class. We hope that most projects will be continued (in some shape or form) long beyond the timeframe of this class and so documentation is key. Think of your final report as a comprehensive piece of work that you could pass on to a future team so that they can learn from what you've done, even years after you've left Berkeley. Also note that final presentations (ppt or pdf files) and final reports will be posted to Ashok's website: <http://eetd.lbl.gov/staff/gadgil/teaching.html>.

Required Discussion, M 10-11AM:

You should plan to attend all of the Monday discussions. The following activities take place in this time slot: guest lectures, GSI-lead discussions, team presentations, cross-team activities, and some of the required meetings with the instructor and GSI (see below).

Required Meetings with Instructor and GSI:

Each team is required to meet with the instructor every three weeks, and with the GSI every two weeks. These meetings can take place in the discussion hour (if it is open), or in office hours (your team must sign up in advance). Note that team meetings are staggered so that the Instructor and GSI can meet with approximately the same number of teams each week.

Important Dates:

Holiday	Mon Jan 19
Project Selection	Wed Jan 28
Problem/Context Presentations	Wed Feb 11
Holiday	Mon Feb 16
Spring Break	Mon Mar 23 - Fri Mar 27
Midterm Presentations	Wed Apr 1, Mon Apr 6
Midterm Progress Reports Due	Wed Apr 8
Final Presentations	Mon May 4, Wed May 6
Final Papers Due	Wed May 13

Detailed Syllabus (as of Feb. 18, 2009, new versions will be posted on bSpace):

	Date	Topic	Readings	Tasks
Week 1	1/21/2009	Introductions, expectations, admin details, process, introductions to projects, student introductions, and student expectations (Lecture-01) .	1. Parris and Kates (2003) 2. Mihelcic et al (2003) 3. Stiglitz- The World Is Not Flat 4. Visit the posted websites about HDI, etc. [Optional Readings: Lele (1991), Marshall and Toffel (2005)]	Identify projects that interest you and possible teammates.
Mon Section	1/26/2009	Q&A Session for Projects.		
Week 2	1/28/2009	Down select projects by vote. Identify projects and teams. Confirm that selection process was fair and reasonable.	1. Sainath: Introduction, Pages 1-77, 445-447 2. Happiness (Economist 2006) 3. AKN Reddy (1989) 4. Innovations (Business Week 2005) [Optional Readings: Billionaire (NYTimes 2006), Money and Happiness (Newsweek 2007)]	Define project goals, methods, and expected outcomes.
Mon Section	2/2/2009	Past students and mentors will explain how to operate a successful team, work with mentors, and identify resources.		Begin to prepare team presentations on 'Problem Background, Context, and Project Plan'
Week 3	2/4/2009	Background: Sustainable development, HDI, MDG, socioeconomic characteristics of developing countries (Lecture-02) . NPV, discounting, levelized costs, and economics of consumer behavior (Lecture-03) .	1. Norman: Pages 1-53 2. Eight Commandments (Economist 2007) 3. Herman Daly on Steady State Economics 4. Rabl (1996) 5. Poverty in Africa (2007) [Optional Readings: Train (1985), WHO essay on discounting health and mortality]	Define project goals, brainstorm, cull ideas, identify tasks, schedule, & divide tasks. HW on discounting assigned.
Mon Section	2/9/2009	Technical mentor presentation and machine shop info.	1. Nunez Stove (LATimes 2007)	
Week 4	2/11/2009	Presentations on 'Problem Background, Context, and Project Plan' (10 minutes per team).	1. Sainath: pages 135-192 2. Design for the World's Poor (NYTimes 2007) 3. Global Wealth Inequality (2006)	
Mon Section	2/16/2009	HOLIDAY: President's Day		
Week 5	2/18/2009	Diffusion of Innovations Part 1 (Lecture 04) . Alice Agogino (Invited Lecture- confirmed) "User-Centered Design" 11-12.	1. Norman: pages 54-80. 2. ORS in Pakistan 3. Ashish Bose (1997) 4. Polio (2006)	HW on discounting due (in class).

Mon Section	2/23/2009	Jonathan Banda (Invited Speaker-confirmed) "What you need to know about CPHS."		Deeper background research. Explore multiple solutions to reach your goals.
Week 6	2/25/2009	John Hammock (Invited Lecture – confirmed). "Practical Lessons for Practical Idealists. 10-11. Diffusion of Innovations Part 2. (Lecture-05).	1. Sainath: pages 195-270 2. AKN Reddy - Barriers (1991) 3. Millions for Millions (New Yorker 2006) 4. Health Care (JAMA 2003)	
Mon Section	3/2/2009	David Ewing (Invited Speaker- confirmed) "The Complexity of Answering Questions Truthfully."		Begin to down select from multiple solutions, eliminate ones with fatal flaws, strengthen others, & develop testing plans.
Week 7	3/4/2009	Diffusion of Innovations part 3: (Lecture-06). Case Study: Tilonia, Bunker Roy, SWRC, Barefoot College (Lecture-07).	1. Bunker Roy (1997) 2. Bunker Roy Rural vs. Urban (1997) 3. Stalled on the Road (1994) 4. Conserving Energy With CFLs (1990) [Optional Reading: UNU-IAS Paper 103]	
Mon Section	3/9/2009	Kurt Kornbluth (Invited Speaker- confirmed) Modular lighting & UC Davis Program in International Energy Technologies (PIET)		Stay open to new ideas. Develop testing plans. Some teams will start building and testing prototypes.
Week 8	3/11/2009	Top down CFL Lighting Programs: BELLE - a program that failed, IlluMex and PELP - programs that succeeded (Lecture-08). Midcourse Evaluation.	1. Limits of Leapfrogging (2008) 2. Valuing The Earth (Daly Ch14) 3. Sainath: pages 317-370 [Optional Reading: Supercomputer for Africa (2007)]	
Mon Section	3/16/2009	George Scharffenberger (Invited Speaker – confirmed)		Begin thinking about Midterm Presentations and Reports
Week 9	3/18/2009	Conclude Top down CFL Lighting Programs. (Lecture 09). Robert van Buskirk (Invited Lecture - confirmed) 11-12.	1. Karnani on BOP (2006) 2. Valuing The Earth (Boulding Ch16) 3. Valuing The Earth (Hubbert Ch5) 4. <i>Skim</i> Buskirk Solar Stove Project (2008) 5. <i>Skim</i> IRC Arsenic (2007)	
Mon Section	3/23/2009	Spring Break		
Week 10	3/25/2009	Spring Break		
Mon Section	3/30/2009	No Section – Work on Midterm Presentations.		

Week 11	4/1/2009	Three Teams: Midterm Team Presentations (20 minutes per team). Voting by rest of the class on each presentation	1. Formula-1 Wheelchair (2006) 2. Smith (Science 2002) 3. Sainath: pages 373-417 [Optional Reading: Valuing The Earth (Daly Intro)]	
Mon Section	4/6/2009	Two Teams: Midterm Team Presentations (20 minutes per team). Voting by rest of the class on each presentation		
Week 12	4/8/2009	Midterm Progress Report Due! ESW-Berkeley Intro, Darfur Stoves (Lecture-10).	1. Wharton Africa (2007) 2. Darfur Stoves (Newsweek 2007) 3. Jagadeesh Cookstoves (2004) 4. Amartya Sen Libertarian Arguments (2007)	
Mon Section	4/13/2009	Safe Affordable Drinking Water: UVWaterworks Part-1 (Lecture-11).		
Week 13	4/15/2009	Final presentation, report, & binder expectations. Johanna - design strategies for community-based arsenic removal system. Ed Vine (Invited Lecture- confirmed) "Project Impact Evaluation and Assessment" 11-12.	1. Lesson from OLPC Demise (2007) 2. Gadgil Drinking Water (1998) 3. Read any three interviews out of Social Innovation Interviews	Start outline of final report.
Mon Section	4/20/2009	Elevator Pitches.		
Week 14	4/22/2009	Safe Affordable Drinking Water Part-2 (Lecture12) Mathias Craig (Invited Lecture- confirmed) "Case Study: blueEnergy" 11-12.	1. Zukerman introduces Paul Polak (2007) 2. Jaipur Foot (2003) 3. Reiche Electrification (2000)	
Mon Section	4/27/2009	Cancelled.		
Week 15	4/29/2009	Dr Abhay Bang & SEARCH (Lecture 13) IDE-India & Treadle Pump, Positive Deviance (Lecture-14.)	1. IDE India (2005) 2. Martin Fisher (2008) 3. <i>EITHER</i> Dr. Bang's WorldBank Slides & News story (2005) OR View Bang's talk at the World Bank site.	
Mon Section	5/4/2009	Cancelled.		
Week 16	5/6/2009	Three Teams: Team presentations. 20-minutes per team. Course evaluations.		

Mon Section	5/11/2009	Two Teams: Team presentations. 20 minutes per team.		
Week 17	5/13/2009	Final Report Due at MIDNIGHT! No class.		

Supplemental Reading List:

(Note that this list is purely for your own enjoyment and further education. It was created over the past three years of this course. Many students wanted recommendations to amazing books that shed light on some of the ideas mentioned in the course.)

1. Amartya Sen (2000): Development as Freedom
2. Amartya Sen (1983): Poverty and Famine
3. Barrington Moore (1993): Social Origins of Dictatorship and Democracy: Lord and Peasant in the Making of the Modern World
4. Barbara Ehrenreich (2002): Nickel and Dimed On (Not) Getting By in America
5. Carl Sagan and Ann Druyan (1997): The Demon Haunted World: Science as the candle in the Dark
6. Clayton Christensen (2003): The Innovator's Dilemma
7. Daniel Boorstin (2001): The Discoverers
8. Steven D. Levitt and Stephen J. Dubner (2006): Freakonomics
9. David Halberstam (2001): The Best and the Brightest
10. Donella Meadows et al (2004): Limits to Growth: a 30-year update
11. Everett Rogers (2003): Diffusion of Innovation
12. Herman Daly (ed.) (1993): Valuing the Earth
13. James Ferguson (1994): The Anti-Politics Machine
14. James Loewen (2008): Lies my teacher told me
15. Jared Diamond (2005): Guns, Germs and Steel
16. John Perkins (2005): Confessions of an Economic Hit Man
17. Lester Thurow (1993): Head to Head
18. Paul Farmer (2004): Pathologies of Power
19. Paul Samuelson and William Nordhaus (2006): Economics
20. Stephen Kinzer (2007): Overthrow
21. Greg Mortenson and David Oliver Relin (2007): Three Cups of Tea
22. Tracy Kidder (2004): Mountains beyond mountains
23. V. S. Naipaul (1992): India: A million mutinies now
24. Stephen Ambrose (1998): The Rise to Globalism: American Foreign Policy since 1938
25. Paul Hawken, James Oglivi, and Peter Schwartz (1982): Seven Tomorrows
26. Peter Schwartz (1996): The Art of the Long View
27. Thomas Kelly (2005): The Ten Faces of Innovation: IDEO's Strategies for Defeating the Devil's Advocate and Driving Creativity Throughout Your Organization