

UNIVERSITY OF COLORADO
College of Engineering
Department of Civil, Environmental, and Architectural Engineering

COURSE SYLLABUS

- COURSE:** CVEN 4838/5838: Engineering for the Developing World
(Technical elective – 3 credit hours)
- SEMESTER:** Fall 2007
- INSTRUCTORS:** Bernard Amadei PhD, Professor of Civil Engineering and Director, Engineering for Developing Communities Program, University of Colorado at Boulder, E-mail: amadei@colorado.edu; Tel: 303-492-7734; Cell: 303-929-8167
- Barry Bialek, MD, Founder of Nepal Community Development Foundation, Instructor, Sustainable Community Development and Public Health for Engineers, E-mail: barrybialek@comcast.net; Tel: 303-449-4777
- WEB SITE:** www.edc-cu.org/CVEN4838.htm
- LECTURES:** Wednesday: 2-4:50 p.m. Room ECCR 137
- TEXTBOOK:** *Field Guide to Appropriate Technology*, Edited by B. Hazeltine and C. Bull, Academic Press, 2003.
- SPONSORS:** The development of this course is supported through grants from the National Collegiate Inventors and Innovators Alliance and the CU Boulder Engineering Excellence Fund.

"Engineering design is the process of devising a system, component or process to meet desired needs. It is a decision-making process (often iterative), in which the basic sciences, mathematics, and engineering sciences are applied to convert resources optimally to meet a stated objective. Among fundamental elements of the design process are the establishment of objectives and criteria, synthesis, analysis, construction, testing and evaluation." (ABET definition of design).

COURSE DESCRIPTION

This course focuses on appropriate and sustainable technology and small-scale sustainable community planning and development. The course cuts across many technical and non-technical disciplines. Its objectives can best be described as follows:

- Introduce students to open ended problems at the community level
- Help students develop the skills to solve those problems and provide holistic engineering solutions that are sustainable and appropriate to the community being served
- Help students develop cultural and social awareness
- Help students work in interdisciplinary teams
- Give students the opportunity to reflect on the importance of their community service
- Give students a professional work ethic
- Help students gain a better understanding of the importance of engineering in society and in developing community development.

This course is offered as part of the Engineering for Developing Communities program at CU Boulder. The program's mission is to educate a new generation of globally responsible engineering students and professionals who can offer sustainable and appropriate solutions to the endemic problems faced by developing communities worldwide.

This course has been designed around the recommendations for general engineering education suggested in the *ASCE Body of Knowledge for the 21st Century* and by ABET (criteria 3 and 4). More specifically, students taking this class will:

1. Learn the different aspects and phases of engineering projects (conceptual phase, design, construction, implementation, monitoring) by working on real developing community open ended small-scale projects.
2. Learn about the interaction of the built environment with natural systems, and the interplay between technical and non-technical issues shaping engineering decisions in the world today.
3. Acquire an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
4. Develop their ability to work in multidisciplinary teams.
5. Develop and improve their communication skills.
6. Acquire a broader education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
7. Gain insight into what represents poverty and how to contribute to its eradication.

COURSE FORMAT

The course format and content are open-ended. There are no final and mid-term exams, but rather continuous work is expected from the students throughout the semester. The course is centered on two main activities: (1) the co-writing of a book on sustainable community development (graduate students only), and (2) the study of a real small-scale community project (graduate and undergraduate students). Both activities involve individual as well as group work (see more details below).

COURSE GRADING

Student grades will be based on class participation, homework assignments, contribution to the book project, and successful community project management and implementation. More specifically, expectations of students include:

- **Reading:** Students are expected to read the texts and articles as assigned in class. All reading assignments will be discussed in class and require participation.
- **Writing:** Students are expected to contribute various papers and studies on topics of interest. All writing assignments will be integrated into the book project.
- **Attendance:** Attendance is critical to a sufficient understanding and working knowledge of course material. Students should discuss any absences in advance, whenever possible. Class attendance will be kept throughout the semester.
- **Class Participation:** Class participation is essential. Class participation is defined as intelligent, thoughtful articulation of ideas in discussion; respectful listening to other's point of view; asking relevant questions; neither being too dominant nor too passive in the discussions; and wholehearted participation in presentations and exercises. Students will be asked to moderate discussions on various topics.
- **Book project:** All students will participate in the book project and asked to contribute to several chapters. The book project will be led by faculty and graduate students.
- **Projects:** Students are asked to work on a real project throughout the semester. Students are associated with all aspects of project planning, management and execution. Project deliverables include: (i) progress

reports; (ii) reports that contain an overview of the discussions leading to the chosen design; (iii) engineering plans and drawings; (iv) user's guides for community residents to insure project sustainability; and (iv) reflective journals demonstrating student's progress.

- **Travel:** Students are expected to conduct and organize their own site visits for each project. Limited funding is available.

COURSE CONTENT

Topics to be addressed during the semester include:

- 1) State of the world and developing world today
- 2) Technical and non-technical issues for the developing world: poverty issues; developing vs. developed world links; corruption and ethics issues; community planning and development; engineer's role in development; sustainable appropriate technologies, etc.
- 3) The Millennium development goals: definition, goals, targets, role of engineers
- 4) Solutions to developing world problems: past solutions and need for sustainable community development
- 5) What is sustainable community development? Components?
- 6) Development issues: energy, water supply and sanitation, health, construction, household technologies, tools, education, communication, business development
- 7) Development stakeholders: community, government, NGOs, humanitarian organizations, etc.
- 8) Project planning and implementation: assessment, design, implementation, monitoring
- 9) Models of community planning and development
- 10) Community assessment methods
- 11) Participatory action research and primary environmental care methods
- 12) Appropriate and sustainable technologies
- 13) Community knowledge and resources
- 14) Course projects
- 15) Discussion of technologies required for selected projects
- 16) Field trip planning and implementation
- 17) Report writing and project presentations.

BOOK PROJECT

We have been asked to write THE book on sustainable community development. Our publisher is asking us to produce a first draft of the book by December 31, 2007 with a possible publication in late spring or summer 2008. You are part of a team that will jointly contribute to the book, which therefore classifies you as a co-author (assuming that the team decides that your contribution is good enough and that your final course grade is an A). Interested? If yes, then sign up for CVEN 4838/5838, Engineering for the Developing World. The book title, content, publication, publisher selection, promotion, final list of co-authors, etc. will be decided jointly by the course faculty and students.

COURSE PROJECTS

Most of the course projects will be local and will involve teams of 4-6 students. Students who participated in the 2007 May/June Nepal trip can use the Namsaling community project as their term project.