ENGR 162
Introduction to Engineering – Design Workshop

Fall 2008

Classroom: Thorton Hall E303 (Sect. 14)
Instructor: Bradford Bennett
Office Hrs.: Drop in or by appointment

Class schedule: MWF 1:00 – 1:50
bcb3a@virginia.edu 982 0513, KCRC

Graduate Teaching Assistant:
Undergraduate Teaching Assistants:

Final Exam Time Monday, Dec 15, 2008 9 am – 12

Class Instructional Web Page:
https://toolkit.itc.virginia.edu/cgi-local/tk/UVa_SEAS_2008_Fall_ENGR162-14
Class Email: SEAS_2008_Fall_ENGR162-14@toolkit.virginia.edu

1. Course Goal
The primary goal of ENGR 162 is to introduce students to the fun and challenge of real world engineering practice through multidisciplinary design experiences and realistic, open-ended problem solving. The course seeks to develop an appreciation for the importance of the context (social, cultural, economic, environmental, organizational, regulatory…) in which the technical work of engineers is accomplished and for the role and need for oral and written communications skills, multidisciplinary teamwork, innovation, and creativity. The role and importance of analytical skills, which are the core of the undergraduate engineering student’s curriculum, is also demonstrated. Emphasis is on a balanced perspective incorporating contextual (non-technical) factors, which are sometimes more critical than analytical skills in determining the success of the modern engineer.

2. Learning Objectives
ENGR 162 will help you understand design as the principal and pervasive activity of the engineer. We will define the concept of ‘design’ and learn approaches to design (design method and strategy) and innovation. Exercises and open-ended problem solving are intended to develop appreciation for the role of creativity and guided intuition in the engineering process, and to develop the proper mentality and habits needed for effective problem solving and design. You can also expect to develop and sharpen problem solving skills by learning how to properly define a problem, identify performance/design objectives, break down the problem and distribute component responsibilities (organized teamwork), understand the role and methods of reporting/documentation, and the role of failure in engineering. You will also learn to apply computer skills (e.g. spreadsheet, statistical analysis and mathematical programming) to the formulation, planning and solution of engineering design problems.

The ENGR 162 workshop is expected to contribute to the achievement of ABET outcomes:
(c) an ability to design a system, component, or process to meet desired needs  
(d) an ability to function on multi-disciplinary teams

All Course objectives contribute to both outcomes.

Outcomes:

1. Work in teams to define engineering problems, develop specifications, develop innovative solutions and prototypes, apply concept selection techniques and develop a final design. INTERIM REPORTS, FINAL REPORT.
2. Present project analysis, development and results in both oral and written form. FINAL REPORT, FINAL PRESENTATION
3. Formulate problems for computational solution and use computer applications for solving analytical problems, data analysis and graphical presentation. LAB, FINAL REPORT
4. Design, build and demonstrate/test an engineering solution. FINAL PRESENTATION
5. Address cost, safety, health and ethical issues in one or more engineering designs. FINAL REPORT, citations
6. Experience the fun and challenge of engineering. COURSE EVALUATION
7. Address the context (cultural, organizational and technical) in which engineering practice occurs. INTERIM REPORTS, FINAL REPORT

3. The Project

This course is focused around semester long design projects. Teams of 4 students will tackle individual design problems. In some cases design projects are related and in these situations there will cooperation and interaction between teams. The final product of the design is either a working prototype or a non-working prototype and a complete set of engineering drawings and materials list.

4. Catalog Description of ENGR 162

An introductory course in engineering, integrating problem solving and design practice. Students will develop skills in the use of computer application packages for web page design, modelling and visualization (CAD), spreadsheets and a math solver. These skills will be applied to computer assignments and to team design projects that feature conceptual design, analytical design, and design and build activities. Lecture topics will include methodologies and applications of computation, problem solving, and design.

Texts:

The Art of Innovation, by Tom Kelly, Currency.

Suggested/Optional Reading


Ask the Right Questions, Creating the Answers that Work
Gerald Nadler and William J. Chandon, The Center for Breakthrough Thinking Press, 2003

Breakthrough Thinking and the Seven Principles of Problem Solving
Gerald Nadler and Shozo Hibino, Prima Publishing 1994 (out-of-print)

The Ten Faces of Innovation: IDEO's Strategies for Defeating the Devil's Advocate and Driving Creativity Throughout Your Organization by Thomas Kelley and Jonathan Littman.
5. Policy and Procedure

Notes: All written assignments are to be submitted electronically by 5:00 PM of the stated due date. Oral presentations should be supported by a PowerPoint presentation and this presentation should be submitted electronically by 5:00 PM of the stated due date (although they obviously will be presented on that day in class. Generally, late work will not be accepted without some penalty.

Honor System: Unless specifically noted you are encouraged to prepare homework assignments with team members. All individuals who work on an assignment should have their names on the assignment. In many instances, collaboration with others may be required (as in design team project work).

The Fundamental Canons of Engineering Ethics provide for engineers to give proper credit for engineering work to those whom credit is due. Therefore, references should be cited on all written work to acknowledge the aid of other individuals including both published and unpublished sources.

6. Grading

The Design Workshop Assignments are broken down as follows: (This is approximate. Weights may be adjusted as semester unfolds.)

1) **Conceptual Designs** - Written Report (Team): 5%
2) **Preliminary Designs & Prototypes** - Written Report (Team): 10%
3) **Detailed Design** – Final Design and Prototype (Team): 25%
   a. This grade will a joint rating by the course instructor and project client!!!
4) **Final Presentation and Report** (Team) - 10% (There will not be a final exam.)
5) **Other assignments & Class participation** – 15%
6) **Evaluations** by Team Members - 5%
7) **Midterm** 10%
8) **Computer Laboratory Assignments** - 20%