

**SCHOOL OF ENGINEERING
UNIVERSITY OF GUELPH**

**ENGG*4110 Biological Engineering Design IV
ENGG*4120 Engineering Systems and Computing Design IV
ENGG*4130 Environmental Engineering Design IV
ENGG*4150 Water Resources Engineering Design IV**

Course Outline - Winter, 2011

Instructor: **R.B. Brown**, PhD, P.Eng.,
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Note: Course material is posted on Courselink D2L site

Course Restrictions: This course may only be taken by engineering students in their final academic semester. Each design group and project must be approved by the course coordinator during the course selection pre-registration period.

Textbooks (Recommended):

Law for Professional Engineers (Fourth Edition). 2008. Donald L. Marston. McGraw-Hill Ryerson. Toronto. ISBN 978-0-07-098521-6

Canadian Professional Engineering and Geoscience: Practice and Ethics. (Fourth Edition) 2009. Gordon C. Andrews. Nelson Education Ltd. Toronto. ISBN 978-0-17-644134-0

Course Objectives: The goal is to prepare students to deal with open-ended, multi-faceted design problems similar to those that they will encounter as working professionals. To that end, students will: (1) apply their academic knowledge to the solution of a specific engineering problem, (2) collect and analyse information and synthesize solutions taking into account significant technological, commercial, social and environmental factors, (3) summarize and communicate the design solution in written and graphical form as a final report, and, (4) present their design in a poster format at the end of the semester. The following specific activities will be required:

- (a) **Submit a proposal** - An engineering project proposal will be submitted to the faculty advisor for grading (and to the external advisor if there is one). The proposal defines the context, scope, duration, schedules and deliverables for the interim and final design reports.
- (b) **Submit an interim project report** - An interim report is submitted to the faculty advisor for grading (and to the external advisor) detailing progress and presenting information and proposed design alternatives for discussion and approval.
- (c) **Submit a final design report** - The final design report and all deliverables agreed to at the proposal stage will be submitted at the end of the semester. The faculty advisor will evaluate the work submitted and assign a grade to it.
- (d) **Create a poster** - Each team will create a poster presenting their work. Members of

the faculty, the University community and local engineers will be invited to view the posters, discuss them with the participants and offer comments to the course coordinator who will evaluate both the poster and the group's support of their work.

(e) **Submit team and individual design assignments** - Each team will prepare progress report memoranda **for the course coordinator** at the submission of the proposal, at the submission of the interim report and at the end of the 11th class week prior to the poster presentation. The contribution of each student in the group to each report must be clearly stated, along with a summary description of each aspect of the work completed and discussion of overall progress. A group evaluation form is available for this purpose. The group members must all sign the form indicating agreement and acceptance of the content.

Two individual assignments related to creativity and idea generation in the design process will be submitted **by each student** and will be graded by the course coordinator for content, style and grammar.

In addition to their work on the team design project, all students will study material on professional practice, engineering ethics, law and liability relevant to the professional practice examination (PPE). A final written examination will be based on that material.

Course Format: Classes are scheduled each week on **Monday, Wednesday and Friday from 08:30-09:50** in **Thornbrough Room 1307**. In addition to classroom time, it is expected that each team member will spend an average of **15 hours per week** on the design project over the semester, i.e., this course is equivalent to two regular senior engineering science courses.

Students work in teams of three or four persons. Smaller (or larger) groups are only considered by the course coordinator under extraordinary circumstances, and approval is conditional on availability of sufficient resources. Inter-disciplinary groups are encouraged if a particular problem has sufficient scope to provide appropriate experience to all team members. ***It is expected that the selection of the team, the project and the faculty advisor was arranged before the start of the semester.***

Each team is advised by a School faculty member responsible for helping to delineate the terms of reference for the project, providing guidance where necessary, and evaluating all written reports. The projects are self-administered: each team must carry out planning and execution of the project on its own. There will be ***no extension of the deadlines for submissions***, except for serious health or compassionate reasons (see University of Guelph Undergraduate Calendar at <http://www.uoguelph.ca/registrar/calendars/undergraduate/current/>). ***Team members and their faculty advisor should discuss and record any concerns about the group's progress at the interim report stage and take appropriate action.***

School Resources: Students are encouraged to design and build components or prototypes of devices if possible. Facilities of the School machine shop, access to all undergraduate laboratories and associated instruments and equipment are available subject to approval. The need for, and costs of, materials, special services or use of other facilities should be foreseen. ***Requests must be made in writing to the course coordinator specifying the exact nature of the service required.*** Small grants are available to purchase materials or components which are essential to the project but cannot be sourced within the School. A brief proposal in memo form must be submitted to the course coordinator for such items **within the first two weeks of the semester**. The funds available depend upon the School's budget, and are not guaranteed.

Report Requirements: Reports will follow the standard engineering report format followed in ENGG2100 and ENGG3100. Text will be supplemented with diagrams, charts, graphs and illustrations that contribute to overall clarity. Appendices should be typed if they are descriptive text but may be neatly handwritten in **black ink** if they contain a large number of engineering calculations. All calculations and drawings must be checked and approved (signed and initialled) as in standard engineering practice.

Grade Assigned: The final grade will be determined from the team work submitted to the faculty advisor and course coordinator, from evaluation of the poster presentation, from the assignments and final examination and will be weighted as follows:

Proposal	5 %
Interim Report	15 %
Final Report	40 %
Poster Presentation	10 %
Design Assignments	10 %
Final Examination	20 %

Individual grades assigned to members of a team for group work may vary only if substantial differences in effort are documented by the signed contribution sheets submitted with memos. Adjustments will be made by the course coordinator in consultation with the faculty advisor and the team members.

Week No.	Student Design Activity and Milestones
0	- Selection of project, formation of team, and selection of faculty advisor
1	Confirm terms of reference and schedule faculty advisor meeting times. Proposal to faculty advisor and first memo to course coordinator by Monday, January 17, 2011, 17:00 h.
2-4	Analyse and research problem, develop design alternatives, evaluate and specify prime contender. Submission of interim report and memo on or before Monday, February 7, 2011, 17:00 h.
5-12	Develop and specify final design, evaluate and refine. Submission of final design report and memo on or before Friday, April 8, 2011, 17:00 h. Poster presentation - Friday, April 8, 2011, 11:30-14:20 h. Location TBA

Attendance: Note! Attendance of all group members at the final poster presentation and evaluation is a course requirement.

Topics for Class Meetings

Engineering Design Process. Writing a memorandum. Creativity and idea generation for design. *The Engineering Proposal.*

History and evolution of the engineering profession in Canada, regulation of engineering in Ontario, The Professional Engineers Act, O.Reg. 941. *Design stages - tools and techniques.*

Theory of Inventive Problem Solving (TRIZ).

The Engineering Code of Ethics. Ethical reasoning. Writing style for engineering reports. *The Interim (Progress) Report*

The Kipling Ritual (Iron Ring Ceremony). *Design ideas from nature – biomimicry.*

Code of Ethics at work: PEO video resource case studies. *Design Failures and Engineering Advances.*

Ethics case studies. Lessons from the blue pages, disciplinary measures.

Introduction to Engineering Law: definitions, terms and precedents in tort law.

Tort law case studies. *The Final Design Report and Poster Presentation*

Contract law principles terms and precedents, contract law case studies.

Preparation for the Professional Practice Examination. *Final design report, poster preparation and presentation.*

Major Holy Days: The student must contact the instructor within the first two weeks of class if academic consideration is to be requested due to religious reasons.

Disclaimer: The instructor reserves the right to change any or all of the above in the event of appropriate circumstances, subject to University of Guelph Academic Regulations.

Academic Misconduct: The School operates on a zero-tolerance policy in these matters. Refer to the University of Guelph, Undergraduate Calendar (see below).

<http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-amisconduct.shtml>