Course Outline

Instructor
- Prof. Derek Oliver, P.Eng.
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Technical Communication Specialist
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Office Hours
- After lectures or by appointment

Contact Hours
- 6 credit hours
- Lectures: 18 hours
- Student Presentations: 12 hours
- Presentation Day: 5 hours

Electrical Engineering Prerequisites:
- ENG 2030/2040, ECE 3670, ECE 3780, ECE 3580, ECE 3720, ECE 3610

Computer Engineering Prerequisites:
- ENG 2030/2040, ECE 3780, ECE 3700, ECE 3760, ECE 3740

Course Website:
https://umanitoba.ca/faculties/engineering/departments/ece/curr_students/undergrad/capstone.html
https://umanitoba.ca/umlearn

ECE 4600 – Group Design Project

Fall 2020 / Winter 2021

Course Objectives

Almost all professional engineers find themselves involved in some sort of team work for many aspects of their professional activities. Novel engineering research and design is performed by individuals in the context of projects or goals which require, or will require, the involvement of many other individuals. As such, it is important that engineering students learn to carry out research and design tasks as members of groups of individuals. To achieve this purpose the ECE 4600 Group Design Project course is mandatory in the Electrical and Computer Engineering curricula. The CEAB[1] Accreditation Criteria and Procedures succinctly states the main goal of this course with regard to design content and team work:

> • ***Engineering design*** *integrates mathematics, basic sciences, engineering sciences and complementary studies in order to develop elements, systems and processes to meet specific needs. It is a creative, iterative, and often open-ended process subject to constraints which may be governed by standards or legislation to varying degrees depending upon the discipline. These constraints may relate to economic, health, safety, environmental, social or other pertinent interdisciplinary factors.*
>
> • *The engineering curriculum must culminate in a significant design experience conducted under the professional responsibility of faculty licensed to practise engineering in Canada, preferably in the jurisdiction in which the institution is located. The significant design experiences is based on the knowledge and skills acquired in earlier course work and it preferably gives students an involvement in* ***team work*** *and* ***project management****.*

Course Content

As well as the technical content of each group project, students will learn/exercise the following skills:

- Working in groups to achieve a substantial engineering design project
- Writing a detailed project proposal with realistic specifications
- Effective procedures for the division of labour amongst group members
- Creating and maintaining a schedule with milestones
- Maintaining an up-to-date Engineering Logbook
- Giving written and oral progress reports
- Writing a final engineering group report
- Making an oral group presentation of the project results
- The course will also cover Engineering Law, where students will learn the meaning of law, contracts, expert witness, legal responsibility, and liability.

References

1. Turabian, Kate L. *A Manual for Writers of Term Papers, Theses and Dissertations*, Revised and Expanded by Bonnie Birtwhistle Honigsblum. Chicago: University of Chicago Press, 5th edition, 1987. (4th edition: UML Engineering, Reserve, LB 2369 T8 1973)
2. Gibaldi, Joseph. *MLA Style Manual and Guide to Scholarly Publishing*, New York: The Modern Language Association of America, 2nd edition, 1998. (UML Engineering, Reference, PN 147 G444 1998)
3. *IEEE Editorial Style Manual*, https://journals.ieeeauthorcenter.ieee.org/your-role-in-article-production/ieee-editorial-style-manual/
4. *The Chicago Manual of Style*, Revised and Expanded, Chicago: University of Chicago Press, 13th edition, 1993. (UML Sci/Technology, Reference, Z 253 U69 1993)
5. *The Canadian Style: A Guide to Writing and Editing*. Revised and Expanded Edition. Toronto; Oxford: Dundurn Press Limited in co-operation with Public Works and Government Services Canada Translation Bureau, 1997. (UML Dafoe, Quick Reference, PN 147 C35 1997).

Important Dates

- **Voluntary Withdrawal Deadline**
  January 27th, 2020
- **Thanksgiving Day**
  October 12th, 2020
  No classes or examinations
- **Remembrance Day**
  November 11th, 2020
  No classes or examinations
- **Fall Term Break**
  November 9th–13th, 2020
  No classes or examinations
- **Spring Break**
  February 15th–19th, 2021
  No classes or examinations
- **Good Friday**
  April 2nd, 2021
  No classes or examinations

Accreditation Details

Accreditation Units

- Mathematics: 0%
- Natural Science: 0%
- Complementary Studies: 0%
- Engineering Science: 0%
- Engineering Design: 100%

Grading Scale

Letter	Mark
A+	95–100
A	85–94
B+	80–84
B	70–79
C+	65–69
C	55–64
D	45–54
F	< 45

Note: These boundaries represent a guide for the instructor and class alike. Provided that no individual student is disadvantaged, the instructor may vary any of these boundaries to ensure consistency of grading from year-to-year.

Evaluation Details

The final course grade is determined by the student's performance on the design project both individually (Individual Mark), and with their group members (Group Mark). Students must pass each component making up the final mark in order to obtain a passing grade in the course. Course instructors may make adjustments to the Group Mark, in order to take into account variations in the degree of technical difficulty between different projects.

	Component	Value
Group Mark	Proposal	5
	3 Design Reviews (5% each)	15
	Final Report	25
	Project Final Summary (submitted with the final report)	5
	Normalization between groups/projects (Course Co-ordinator)*	± 10
Individual Mark	Engineering Record - milestone and final reviews (each 5%)	25
	Proposal / Design Review oral presentation(s)	10
	Final Oral Presentation	15
	Individual group member evaluations by supervisor (zero-sum amongst group members.)*	± 10
* Determined by course coordinator in consultation with the project supervisor(s).		100

Academic Integrity

Students are expected to conduct themselves in accordance with the highest ethical standards of the Profession of Engineering and evince academic integrity in all their pursuits and activities at the university. As such, in accordance with the *General Academic Regulations* on *Academic Integrity*, students are reminded that plagiarism or any other form of cheating in examinations, term tests, assignments, projects, or laboratory reports is subject to serious academic penalty (e.g. suspension or expulsion from the faculty or university). A student found guilty of contributing to cheating by another student is also subject to serious academic penalty.

Copyright Notice

Requirements and Regulations

- Attendance at lectures and laboratories is essential for successful completion of this course. Students must satisfy each evaluation component in the course to receive a final grade.
- It is the responsibility of each student to contact the instructor in a timely manner if he or she is uncertain about his or her standing in the course and about his or her potential for receiving a failing grade. Students should also familiarize themselves with the University's *General Academic Regulations*, as well as Section 3 of the Faculty of Engineering *Academic Regulations* dealing with incomplete term work, deferred examinations, attendance and withdrawal.
- No programmable devices or systems (such as calculators, PDAs, iPods, iPads, cell phones, wireless communication or data storage devices) are allowed in examinations unless approved by the course instructor.
- Students should be aware that they have access to an extensive range of resources and support organizations. These include Academic Resources, Counselling, Advocacy and Accessibility Offices as well as documentation of key University policies e.g. Academic Integrity, Respectful Behaviour, Examinations and related matters.

Supplemental Information

Accreditation Details

Graduate Attributes

KB: A knowledge base for engineering
PA: Problem analysis
IN: Investigation
DE: Design
ET: Use of engineering tools
IT: Individual and team work
CS: Communication skills
PR: Professionalism
IE: Impact of engineering on society/ environment
EE: Ethics and equity
EP: Economics and project management
LL: Life-long learning

Competency Levels

1 - Knowledge (Able to recall information)
2 - Comprehension (Ability to rephrase information)
3 - Application (Ability to apply knowledge in a new situation)
4 - Analysis (Able to break problem into its components and establish relationships.)
5 - Synthesis (Able to combine separate elements into a whole)
6 - Evaluation (Able to judge the worth of something)

Retention of Student Work

Students are advised that copies of their work submitted in completing course requirements (i.e. assignments, laboratory reports, project reports, test papers, examination papers, etc.) may be retained by the instructor and/or the department for the purpose of student assessment and grading, and to support the ongoing accreditation of each Engineering program. This material shall be handled in accordance with the University's *Intellectual Property Policy* and the protection of privacy provisions of *The Freedom of Information and Protection of Privacy Act (Manitoba)*. Students who do not wish to have their work retained must inform the Head of Department, in writing, at their earliest opportunity.

Learning Outcomes

1. Undertake a multi-person engineering project. Aspects include specifications, construction, and implementing - from concept, to design, to final implementation.
2. Planning and documenting an engineering project, including prediction/application of division of labour, scheduling, budgeting, progress report, and logbook.
3. Communicating engineering ideas and work to engineers and society at large, in written reports, oral presentations, and including comparison and evaluation of other group efforts.
4. Understanding of law, as pertaining to the practice of engineering, accountability, and the role and identification of intellectual property and show logged documentation of self/group work.

Expected Competency Levels

Outcome	KB	PA	IN	DE	ET	IT	CS	PR	IE	EE	EP	LL
1	5	6	5	6	5	6	6	6	6	3	6	6
2	3	4	4	4	3	5	5	6	6	3	6	6
3	6		6		4	5	6	6			4	6
4	4	2				3	3	6		4	4	6

Evaluation

Students must pass each component making up the final mark in order to obtain a passing grade in the course. Course instructors may make adjustments to the Group Mark, in order to take into account variations in the degree of technical difficulty between different projects.

Component	Value (%)	Method of Feedback	Learning Outcomes Evaluated
Engineering Record	25	F, S	1, 2, 3, 4
Proposal	7.5	F, S	1, 2, 3
Progress Reports	22.5	F, S	1, 2, 3, 4
Final Report	25	S	1, 2, 4
Final Oral Presentation	15	S	1, 2, 3, 4

* Method of Feedback: **F** - Formative (written comments and/or oral discussion), **S** - summative (numerical grade)

CEAB Graduate Attributes Assessed

DE.1 – Understands the complexities of an open-ended engineering design problem and defines appropriate objectives and constraints.
DE.2 – Uses an appropriate design process that considers all relevant factors (i.e., health & safety risks; standards; economic, environmental, cultural and societal considerations).
DE.3 – Develops/implements possible solutions to an open-ended design problem, leading to an appropriate recommendation.
DE.4 – Devises and implements a plan to evaluate a proposed design solution.
ET.2 – Evaluates and selects appropriate tools for a given scenario.
IT.2 – Predicts environmental and socio-economic impacts associated with engineering activities.
CS.2 – Designs and produces appropriate engineering documents (i.e., research reports, engineering reports, design documents, graphics).
CS.3 – Delivers effective technical presentations.
EE.1 – Demonstrates and/or applies knowledge of ethical principles.
EP.3 – Critically applies management tools and economics principles in engineering projects.
LL.1 – Applies appropriate knowledge to new situations.