

**The University of Western Ontario  
Faculty of Engineering**

**IE 4499 - Interdisciplinary Engineering Design Project**

**Course Outline 2021/22**

This course is the capstone for the undergraduate program in Integrated Engineering. The general objectives are for students to:

- Analyze and interpret data and information provided by others to determine project-specific design criteria and parameters.
- Gain experience functioning on multi-disciplinary teams that include participating practicing engineers and businesspersons.
- Understand professional and ethical responsibility through the refinement of the design to address the needs of the general public.
- Improve communication skills by: (a) meeting regularly with external and internal advisors; (b) documenting design decisions in clear and concise calculations and notes; (c) planning and preparing drawings and specifications to facilitate construction of a prototype, and a final report, including cost estimate, that completely describes the design proposed; (d) presenting and defending their final design before their peers and before the general public; (e) keeping records of the time spent on various aspects of the project; and, (f) allotting the distribution of grades to the individual members of the design team.
- Develop an ability to use the techniques, skills and modern engineering tools necessary for engineering practice.
- Identify personal and team limitations in knowledge and skills and to learn and expand that knowledge independently to successfully complete project.

**Prerequisites:**

Completion of Year III of the Integrated Engineering Program. Students who have completed Year III of another Western Engineering Program may be eligible with the permission of the Director of Integrated Engineering and the Undergraduate Chair for their program. (See Project Teams, below).

**Corequisites:**

None

**Antirequisites:**

CBE 4497, CEE 4441. ECE 4416, MME 4499, SE 4450.

**Note:** It is the **student's responsibility** to ensure that all prerequisite and corequisite conditions are met or that special permission to waive these requirements has been granted by the Faculty. It is also the **student's responsibility** to ensure that he/she has not taken a course listed as an antirequisite. The student may be dropped from the course or not given credit for the course towards his/her degree if he/she violates the prerequisite, corequisite or antirequisite conditions.

**Contact Hours:**

4 tutorial hours/week; meetings with advisors

**IE 4499 – Interdisciplinary Engineering Design Project  
Course Outline 2021/22 Rev. – (6 Aug 2021)**

**Faculty Advisor:**

Don Uffen, ACEB 2410B, [duffen@uwo.ca](mailto:duffen@uwo.ca)

**Project Teams:**

Teams for the project will have between 3 and 5 team members. Of this team, at least two persons must be either:

- a. A student in the 4<sup>th</sup> year of the Integrated Engineering program
- b. A 4<sup>th</sup> year Engineering student registered for the Certificate in Engineering Leadership and Innovation having already successfully completed ES 3330 and ES 3331, or,
- c. A dual Engineering and Ivey HBA degree student in having completed their 4th year of the 5-year program.

Students are encouraged to determine design team membership by assessing the skills inventory of potential team members.

**Textbooks and References:**

No specific textbooks are assigned. References include pertinent codes and standards, government publications and legislation and other technical references from Taylor Library.

**Computing:**

Students are required to use personal computers or other devices using Microsoft Office applications and may use other computing facilities at the university.

**Units:**

SI units will be used in lectures, tutorials, calculations and drawings.

**Course Deadlines and Evaluation:**

The deadlines are listed below and the final mark will be determined as follows:

<u>INDIVIDUAL WORK:</u>	<u>Date</u>	<u>Mark</u>	
Logbook	03 Dec 2021	5%	
Preliminary Prototype Submission	03 Dec 2021	<u>20%*</u>	
		25%	25%
<u>GROUP WORK:</u>			
Project Opportunities Report	08 Oct 2021	--	
Project Selection Presentation	week of 20 Oct 2021	10%*	
Progress Presentation	21 Jan 2022	5%	
Final Prototype Submission	30 Mar 2022	30%	
Business Model Submission	04 April 2022	<u>30%</u>	
		75%**	<u>75%**</u>
Total			100%

**NOTE:**

1. Criteria for the various submissions are described later in this document.
2. The penalty for late submission shall be 10% per day; thus, if any submission is more than 5 days late it cannot receive a passing grade.
3. "\*" Indicates components evaluated by the Course Instructor only.
4. The mark for group work (the maximum indicated thus "\*\*") shall be multiplied by the number of group members and the product allocated to the members in proportion to each member's contribution to the work. At the end of the course, the group members must individually recommend in writing, with stated reasons, a suitable allocation to be used. If an individual believes that (s)he will be

**IE 4499 – Interdisciplinary Engineering Design Project  
Course Outline 2021/22 Rev. – (6 Aug 2021)**

- submitting significantly different evaluations of effort, (s)he should alert the Faculty Advisor by March 1 to this possibility to allow remedial action to occur.
5. An accelerated submission schedule is possible through negotiation with the course advisors and demonstration by performance to date that such a schedule is feasible.

1. Project Opportunities Report

This short report will list at least five project opportunities for the design project. In order to be an opportunity, an underlying engineering technology must be identified that can form the potential basis of a commercial product and venture. A researcher, the university through WorldDiscoveries or a private commercial venture could own the intellectual property for the idea. For each project, you must provide the following: (a) title (b) 200-word description and (c) ownership of the IP.

2. Project Selection Presentation (10%)

This oral presentation will rank all the potential projects. Clear criteria must be used to justify the preferred topic selection after a thorough analysis of the options. The selected project must allow students to apply knowledge from at least two engineering disciplines. At the end of the presentation, one project will be selected for further development, with the agreement of the Faculty Advisor.

3. Logbook

**Each student** shall keep a logbook listing at least the following:

- a) Details of meetings - date, time, duration, those present, main topic
- b) Details of work on the Design Project - date, duration, and aspects of work done personally

4. Preliminary Prototype Submission

**Each student** shall submit a preliminary prototype of the project. It shall be of reasonable professional standards for a first prototype and should be suitable for demonstration to interested potential customers and other people. **Each student** shall prepare and submit accompanying documents that explain, with calculations as appropriate, how the fully operational prototype would operate. It is strongly recommended that students review and proofread each other's submissions to ensure they are appropriately written.

5. Progress Presentation

This oral presentation will succinctly describe progress to date and present the plan to complete the remaining work to meet the specified deadlines.

6. Final Prototype Submission

An operational prototype of the project would be developed that demonstrates its function. The prototype does not need to work at the full potential of the idea, but a user should be able to independently explore its opportunity.

The prototype should be accompanied by a 22-inch x 28-inch poster board presentation that explains the engineering technology and underlying functions. There should also be an accompanying document that explains, with calculations if appropriate, how the fully operational prototype operates. The prototype will be presented in a presentation along with the business model in a 20-minute presentation at a mutually agreed time before the end of classes. Grading for the presentation is included in the grade for the prototype.

7. Business Model Submission

**IE 4499 – Interdisciplinary Engineering Design Project  
Course Outline 2021/22 Rev. – (6 Aug 2021)**

A document outlining the business model for the project will be submitted that presents a plan for bringing the design to market, either by an established company or a startup. The business model shall account for: (a) product costing; (b) manufacturing; (c) distribution; (d) service; and, (e) market planning. There should be a clear recommendation of the path forward i.e., commercialization through sale, licensing, new venture creation, etc. The business model will be presented in a presentation along with the prototype in a 20-minute presentation at a mutually agreed time before the end of classes. Grading for the presentation is included in the grade for the business model.

**Assessment of Graduate Attributes**

The following Graduate Attributes will be measured to support accreditation of the Integrated Engineering program. The measurements will be derived from the evaluation as described in the rubric for each assessment in their respective OWL Assignment:

**Individual and Team Work:**

- ITW1: Demonstrate ability to perform responsibly
- ITW2: Demonstrate ability to contribute to team goals
- ITW3: Demonstrate ability to evaluate peer and individual performance based on team effectiveness

**Communication:**

- CS1: Demonstrate ability to follow instructions (listening and reading for comprehension)
- CS2: Demonstrate ability to articulate ideas in writing using appropriate technical language, and effective graphical tools
- CS3: Demonstrate ability to communicate orally using appropriate materials, language, non-verbal communication, and effective graphical tools

**Design:**

- D1: Demonstrate ability to frame a complex, open-ended design problem in engineering terms
- D2: Demonstrate ability to generate a diverse set of candidate engineering design solutions
- D3: Demonstrate ability to select candidate engineering design solutions for further development
- D4: Demonstrate ability to advance an engineering design to a defined end state - completion

**Economics and Project Management:**

- EPM1: Demonstrate ability to incorporate economics into engineering projects
- EPM2: Demonstrate ability to manage time, budget and human resources of a project
- EPM3: Demonstrate ability to incorporate risk management into engineering
- EPM4: Demonstrate ability to incorporate change management into engineering

**Life-long Learning:**

- LL1: Ability to assess limitations in knowledge and skills
- LL2: Learn independently

**In Case of Interruption of In-Person Classes**

It is expected, at time writing, that Western will return to in-person classes in September 2021. However, in the event that University and public health guidance prevent in-person classes or collaboration, the following protocol would be observed:

- In-person meetings and presentations would switch to online

**IE 4499 – Interdisciplinary Engineering Design Project  
Course Outline 2021/22 Rev. – (6 Aug 2021)**

- It would be acceptable for the preliminary and/or final prototypes to be virtual, physical or a combination, with physical prototypes that can be presented in an online format being preferred.

**Use of English**

In accordance with Senate and Faculty Policy, students may be penalized up to 10% of the marks on all assignments, tests, and examinations for improper use of English. Additionally, poorly written work with the exception of the final examination may be returned without grading. If resubmission of the work is permitted, it may be graded with marks deducted for poor English and/or late submission.

**Recording of Learning Sessions:**

Some of the synchronous remote-learning sessions for this course may be recorded so that they can be shared with students who are not able to participate in synchronous activity, e.g. due to time zone differences. The data captured during these recordings may include your image, voice recordings, chat logs and personal identifiers (name displayed on the screen). The recordings will be used for educational purposes related to this course, which may include evaluations. Please contact the instructor if you have any concerns related to session recordings. Participants in this course are not permitted to record the sessions, except where recording is an approved accommodation, or the participant has the prior written permission of the instructor.

**Cheating:**

University policy states that cheating is a scholastic offence. The commission of a scholastic offence is attended by academic penalties that might include expulsion from the program. If you are caught cheating, there will be no second warning.

**Conduct:**

Students are expected to be punctual, and to conduct themselves in a professional and respectful manner.

**Sickness and Other Problems:**

Students should immediately consult with the Instructor or Acting Program Director if they have any problems that could affect their performance in the course. Where appropriate, the problems should be documented (see attached). The student should seek advice from the Instructor or Acting Program Director regarding how best to deal with the problem. Failure to notify the Instructor or Acting Program Director immediately (or as soon as possible thereafter) will have a negative effect on any appeal.

**Notice:**

Students are responsible for regularly checking their UWO e-mail.

**Consultation:**

Students are encouraged to discuss problems with the Faculty Advisors or one of the Coordinators. Other individual consultation can be arranged by appointment.

**Course Breakdown:**

Complimentary Studies (25%)

Engineering Design (75 %)

**IE 4499 – Interdisciplinary Engineering Design Project  
Course Outline 2021/22 Rev. – (6 Aug 2021)**

The document “INSTRUCTIONS FOR STUDENTS UNABLE TO WRITE TESTS OR SUBMIT ASSIGNMENTS AS SCHEDULED” is part of this course outline.