Western University
Faculty of Engineering
Department of Electrical and Computer Engineering

ECE 4415/4416: Computer/Electrical Engineering Design Project

Course Outline 2023-24

Description:

Students will work in teams to tackle a comprehensive engineering design project, building upon the overall undergraduate course material offered through the Computer/Electrical Engineering program. Students are expected to complete milestones related to the design process including: problem definition, generation and evaluations of concepts, engineering analysis and testing, prototype demonstration, oral presentation and project design documentation. Each team will be supervised by a faculty advisor with whom they will meet regularly. Some of the project deliverables such as design reviews, project presentation and demonstrations maybe evaluated additionally by external examiners or other faculty members in addition to the course coordinator, TA and the faculty advisor.

Course coordinator: Prof. Jayshri Sabarinathan, P.Eng.
ACEB 3468, jsabarin@uwo.ca
Consultation hours: By appointment

Academic Calendar Copy: Selection and investigation of a computer/electrical engineering problem. Analytical and/or experimental work is carried out by project groups under the supervision of a faculty member. Progress report and a final engineering report are prepared. Each student must deliver a public oral presentation.

Contact Hours: 6 laboratory hours, 1.0 course.

Antirequisites: CBE 4497, CEE 4441, GPE 4497, MME 4499, MSE 4499, SE 4450, ES 4499.

Prerequisites: Completion of third year of the Electrical, Computer or Integrated Engineering programs.

Unless you have either the requisites for this course or written special permission from your Dean to enroll in it, you will be removed from this course and it will be deleted from your record. This decision may not be appealed. You will receive no adjustment to your fees in the event that you are dropped from a course for failing to have the necessary prerequisites.

CEAB Academic Units: Engineering Design 100%.

Required Textbook: None assigned. General instruction and guidelines related to the course are posted on OWL (https://owl.uwo.ca).

Recommended References: None assigned. It is expected that each student will undertake a suitable literature search for the individual project undertaken.

General Learning Objectives (CEAB Graduate Attributes)

Knowledge Base		Use of Engineering Tools	A	Impact on Society and the Environment	D
Problem Analysis	A	Individual and Team Work	A	Ethics and Equity	
Investigation	A	Communication Skills	A	Economics and Project Management	D
Design	A	Professionalism		Life-Long Learning	D

[Notation: **I** – The instructor will introduce the topic at the level required. It is not necessary for the student to have seen the material before. **D** – There may be a reminder or review, but the student is expected to have seen and been tested on the material before taking the course. **A** – It is expected that the student can apply the knowledge without prompting (e.g. no review).]

Specific Learning Objectives:

By the end of this course, students should be able to apply sound engineering design principles and methodology in arriving at a solution to an open-ended design problem. Students should be able to demonstrate good oral and written communication skills, and work effectively in a team environment of 2-4 members. Specifically, students should be able to do the following. Associated attributes are in brackets in bold.

1. Identify and define an engineering problem requiring a significant component of design, analysis and synthesis and function in a professional manner with minimum supervision. **(D1, PA2)**
2. Conduct background research on existing and emerging technology relevant to the chosen design problem. **(LL2)**
3. Generate multiple possible solutions using disciplinary knowledge **(D2)**
4. Effectively evaluate alternatives and select the best one. **(D3)**
5. Apply engineering knowledge and tools from various engineering disciplines to perform appropriate analysis. **(ET1, ET2)**
6. Validate engineering designs using mathematical modeling, simulation and prototype testing. **(I1, I2, I3, D4)**
7. Plan, organize, schedule and manage the design project including developing a realistic budget and a suitable Gantt chart for carrying out the tasks associated with the project and to adhere to deadlines as a responsible team member. **(EPM2, EPM3, ITW1, ITW3)**
8. Recognize and address environmental, legal, ethical and social implications of an engineering design project – **(IESE1, IESE2, IESE3)**
9. Demonstrate an understanding of the safety hazards by adhering to appropriate safety standards and procedures, and engaging in circuit design and testing procedures that minimizes safety risks. **(Mentioned as relevant, not assessed directly)**
10. Produce professional quality design documentation, including detailed drawings, circuit designs, software designs etc. **(CS2)**
11. Effectively communicate thoughts, ideas and project details in written and oral forms. **(CS1, CS3, LL1)**
12. Use appropriate computer tools to support all phases of the design process **(ET2)**

Project Selection:

The project may be either suggested by a team of students or selected from group projects suggested by faculty advisors. The topic must be related to some aspect of Computer/Electrical Engineering and contain a significant amount of engineering design, analysis and synthesis. The project scope should be large enough enable an approximate even distribution among team members. Project teams can be formed by a minimum of 2 and a maximum of 4 members. The project goal(s) must be clearly identified and must include design, analysis, and experimental protocols to test the outcome. Team projects topics include, but are not limited to: Computer Engineering, Wireless Communications, Power Engineering, Digital Signal Processing and Control, Robotics and Real Time Systems, Biomedical Engineering, Applied Electrostatics and Electromagnetics, Digital Systems and Microprocessors, Networking. **The project selected must have the approval of course coordinator.**

Evaluation: The project will be evaluated based on the following milestones on an individual/team basis as follows:

Course Component	**Weight**
Project Selection and Team Formation	1 %
Library Research Module (Individual)	1 %
Project Proposal	8 %
Design Review 1	5 %
Mid-term Progress Report	15 %
Design Review 2	5 %
Design Validation and Test Plan	10 %
Final Presentation and Prototype Demonstration	25 %
Final Report and Reflection	30 %

In order to pass the course, the final report grade must be at least 50%. In addition, ***component grades below 50% may result in immediate project termination and failure of the course.***

Students are expected to keep a project logbook that is available for periodic review by their advisor/coordinator, and attend and participate in required course lectures as well as regular meetings with their faculty advisor (which are documented). Grading information and due dates are provided on the course web site. Written reports are evaluated the course coordinator, TA and final reports by the faculty advisor also. Factors considered in the evaluation of the submissions include the level of challenge involved in the project, the manner in which the project is carried out as well as the clarity and accuracy of the reports.

In the team projects, a clear division of work must be identified as decided by the members of the team. The team evaluation will include factors such as the degree of teamwork and assessment

of the work assigned to and carried out by each member of the team. By default, team assignment grades will be uniformly distributed among the team members. While highly discouraged, if the contribution of a team member(s) is found to be significantly less than others and is extremely unbalanced, grades of team members who contribute less may be adjusted accordingly to reflect their low contribution. Team grades may be adjusted by up to 15% (relative to equal distribution percentage) for each student based on self and peer evaluation. Grade distribution changes cannot be applied retroactively.

Unless other arrangements have been made, students may be required to return any large components, equipment or documentation provided by the Department/Faculty during the course of the project to the Electronics Shop as directed. Failure to do so may result in the withholding of a grade in the course.

Online Activities: Even though this course is "in-person" most lectures sessions may be given online remotely during the course from time to time. This can be in response to unexpected closures or for material where social distancing in class may pose problems. Online session details will be posted on OWL in advance. These may include both synchronous and asynchronous sessions. Office hours and team meeting sessions will be offered online as well depending on the situation. From time to time online mandatory surveys may be required to be completed. Most deliverables will be required to be submitted online through the OWL site. This can include both documents and potentially video recordings of project demonstrations which will be used for evaluation. It is expected that all students have access to camera and mic for online sessions as the expectation for online activities is that the camera/mic can be switched on when required.

Recording Online Activities: All of the remote learning sessions for this course will be recorded. 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, including evaluations. The recordings may be disclosed to other individuals participating in the course for their private or group study purposes. 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.

Late Submission Policy: Late submission of any report or deliverable will incur a penalty of 10% per day of the component mark. Any deliverables submitted more than 5 days late will not be accepted. An email must be sent to the coordinator whenever late submission is done with date and time of submission.

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.

COVID-19 Resurgence Contingency: In the event of a COVID-19 resurgence during the course that necessitates the course delivery moving away from face-to-face interaction, all remaining course content will be delivered entirely online, either synchronously (i.e., at the times indicated in the timetable) or asynchronously (e.g., posted on OWL for students to view at their convenience).

The Final in-person presentations/showcase will be replaced by recorded or online demonstration to judges. The weight of remaining deliverables may also be adjusted slightly to address challenges (if any) associated with prototype development.

Attendance: Attendance is mandatory for scheduled activities, including required course lectures, design reviews, demonstrations and presentations. Students are required to meet regularly with their team and faculty advisor as scheduled.

Absence Due to Illness or Other Circumstances: Students should immediately consult with the instructor or department Chair if they have any problems that could affect their performance in the course. Where appropriate, the problems should be documented (see the attached "Instructions for Students Unable to Write Tests or Examinations or Submit Assignments as Scheduled"). The student should seek advice from the instructor or department Chair regarding how best to deal with the problem. Failure to notify the instructor or department Chair immediately (or as soon as possible thereafter) will have a negative effect on any appeal.

For more information concerning medical accommodations, see the relevant section of the Academic Handbook:
http://www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_medical.pdf

For more information concerning accommodations for religious holidays, see the relevant section of the Academic Handbook:
http://www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_religious.pdf

Cheating and Plagiarism: Students must write their essays and assignments in their own words. Whenever students take an idea, passage, image, or any other kind of media content from another author, they must acknowledge their debt both by using quotation marks where appropriate and by proper referencing such as footnotes or citations. University policy states that cheating, including plagiarism, is a scholastic offence. The commission of a scholastic offence is attended by academic penalties, which might include expulsion from the program. If you are caught cheating, there will be no second warning.

All required papers may be subject to submission for textual similarity review to commercial plagiarism-detection software under license to the University for the detection of plagiarism. All papers submitted will be included as source documents on the reference database for the purpose of detecting plagiarism of papers subsequently submitted to the system. Use of the service is subject to the licensing agreement, currently between the University of Western Ontario and Turnitin.com (http://www.turnitin.com).

Scholastic offences are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, in the relevant section of the Academic Handbook:
http://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_undergrad.pdf

Policy on Repeating All Components of a Course: Students who are required to repeat an Engineering course must repeat all components of the course. No special permissions will be granted enabling a student to retain laboratory, assignment, or test marks from previous years. Previously completed assignments and laboratories cannot be resubmitted by the student for

grading in subsequent years.

Internet and Electronic Mail: Students are responsible for regularly checking their Western e-mail and the course web site (https://owl.uwo.ca/portal/) and making themselves aware of any information that is posted about the course.

Accessibility: Please contact the course instructor if you require material in an alternate format or if any other arrangements can make this course more accessible to you. You may also wish to contact Services for Students with Disabilities (SSD) at 519-661-2111 ext. 82147 for any specific question regarding an accommodation.

Support Services: Office of the Registrar, http://www.registrar.uwo.ca/
Student Development Centre, http://www.sdc.uwo.ca/
Engineering Undergraduate Services, http://www.eng.uwo.ca/undergraduate/
USC Student Support Services, http://westernusc.ca/services/
Students who are in emotional/mental distress should refer to Mental Health @ Western, http://www.health.uwo.ca/mental_health/, for a complete list of options about how to obtain help.