

**Western University  
Faculty of Engineering  
Electrical and Computer Engineering Program**

***ECE 4415/4416 – ELECTRICAL/COMPUTER DESIGN PROJECT***

**Course Outline Fall/Winter 2025**

**COURSE 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 may be evaluated additionally by external examiners or other faculty members in addition to the course coordinator, TA and the faculty advisor.

**ACADEMIC CALENDAR:**

[https://www.westerncalendar.uwo.ca/Courses.cfm?CourseAcadCalendarID=MAIN\\_015087\\_1&SelectedCalendar=Live&ArchiveID=](https://www.westerncalendar.uwo.ca/Courses.cfm?CourseAcadCalendarID=MAIN_015087_1&SelectedCalendar=Live&ArchiveID=)

Selection and investigation of an engineering problem. Analytical and/or experimental work is carried out by individual students or project groups under the supervision of a faculty member. Progress reports and a final engineering report are prepared; each student must deliver a public lecture.

**PRE OR COREQUISITES:** 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.

**ANTIREQUISITES:** CBE 4497, CEE 4441, MME 4499, SE 4450, Engineering Science 4499

**CEAB ACADEMIC UNITS:** Engineering Design 100%.

**CONTACT HOURS:**

Lectures are scheduled weekly starting September 5. There will not be a lecture every week. Refer to schedule posted on Owl and Owl announcements.

|          |                                                      |
|----------|------------------------------------------------------|
| LECTURE: | 2 hours weekly                                       |
| LAB:     | 6 laboratory hours/week during Fall and Winter terms |

TUTORIAL: N/A

**RECOMMENDED/REQUIRED TEXT:** None assigned. General instruction and guidelines related to the course are posted on OWL Brightspace <https://westernu.brightspace.com/>

**RECOMMENDED/ REQUIRED SOFTWARE:** None assigned. It is expected that each student will identify and utilize suitable software tools required for the project undertaken.

**RECOMMENDED RESOURCES/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   |   | Engineering Tools     | A | Impact on Society           | A |
| Problem Analysis | A | Individual & Teamwork | A | Ethics and Equity           |   |
| Investigation    | A | Communication         | A | Economics and Project Mgmt. | A |
| Design           | A | Professionalism       |   | Life-Long Learning          | A |

Notation: x represents the content level code as defined by the CEAB. blank = not applicable; I = introduced (introductory); D = developed (intermediate) and A = applied (advanced).

Rating: 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).

**COURSE MATERIALS:** Weekly content and guides for the laboratories will be available on the course OWL site. The material for this course will be taught in both lectures and labs; therefore, it is imperative that you attend each lecture and lab.

**UNITS:** SI

**COURSE TOPICS AND SPECIFIC LEARNING OUTCOMES:** 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 4 members.

The following table summarizes the course learning outcomes along with CEAB GAs where the GAs in bold indicate ones to be measured and reported annually.

| Course Topics and Specific Learning Outcomes                                                                                                                                                    | CEAB Graduate Attribute Indicators |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|
| 1. An ability to Identify and define an engineering problem requiring a significant component of design, analysis and synthesis and function in a professional manner with minimum supervision. | <b>D1</b> , PA2                    |

|                                                                                                                                                                                                                                                                  |                         |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|
| 2. Applied level ability to conduct independently background research on existing and emerging technology relevant to the chosen design problem.                                                                                                                 | <b>LL2</b>              |
| 3. Applied level ability to generate multiple possible solutions using disciplinary knowledge                                                                                                                                                                    | D2                      |
| 4. Applied level ability to effectively evaluate alternative design solutions and select the best one.                                                                                                                                                           | <b>D3</b>               |
| 5. Applied level ability to identify and select appropriate engineering tool(s) and resources for capstone project.                                                                                                                                              | <b>ET1</b>              |
| 6. Applied level ability to apply appropriate engineering tool(s) and resources for capstone project.                                                                                                                                                            | <b>ET2</b>              |
| 7. Applied level ability to define and plan the investigation pertaining to capstone project successfully (whether experimental or analytical).                                                                                                                  | <b>I1</b>               |
| 8. Applied level ability to conduct an investigation pertaining to capstone project successfully.                                                                                                                                                                | <b>I2</b>               |
| 9. Applied level ability to analyze and interpret data generated in the group's capstone project to reach valid conclusions.                                                                                                                                     | I3                      |
| 10. Applied level ability to advance an engineering design of capstone project to a defined end state – completion.                                                                                                                                              | D4                      |
| 11. Applied ability to 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. | <b>EPM2, EPM3</b>       |
| 12. Advanced level ability to work effectively as a member and leader in ECE 4415/4416 student team setting.                                                                                                                                                     | <b>ITW1, ITW2, ITW3</b> |
| 13. Applied ability to analyse the interactions of engineering with economic, social, health, safety, legal and cultural aspects of society pertaining to capstone project.                                                                                      | IESE1                   |
| 14. Applied level understanding of the concept of sustainable design and development pertaining to capstone project.                                                                                                                                             | <b>IESE2</b>            |
| 15. Applied level understanding of the concept of environmental stewardship pertaining to capstone project.                                                                                                                                                      | <b>IESE3</b>            |
| 16. Demonstrate an understanding of the safety hazards by adhering to appropriate safety standards and procedures and engaging in circuit design and testing procedures that minimize safety risks. (Mentioned as relevant, not assessed directly)               |                         |

|                                                                                                                                                 |            |
|-------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| 17. Advanced level ability to follow instructions (listening and reading for comprehension).                                                    | <b>CS1</b> |
| 18. Advanced level ability to communicate orally using appropriate materials, language, non-verbal communication and effective graphical tools. | CS2        |
| 19. Advanced level ability to articulate ideas in writing using appropriate technical language, and effective graphical tools.                  | <b>CS3</b> |
| 20. Advanced level ability to assess limitations in knowledge and skills.                                                                       | <b>LL1</b> |

#### EVALUATION:

| Name                                           | % Worth | Due Date          | CEAB GAs ASSESSED |
|------------------------------------------------|---------|-------------------|-------------------|
| Project Selection and Team Formulation         | 2%      | Sept. 22, 2025    | LL                |
| Library Research Module (Individual)           | 1%      | Sept. 29, 2025    | LL                |
| Project Proposal                               | 7%      | Oct. 6, 2025      | CS, I, LL         |
| Design Review 1                                | 5%      | Nov. 7 & 14, 2025 | D                 |
| Team Self-Assessment (Individual)              | 1%      | Nov. 28, 2025     |                   |
| Mid-term Progress Report                       | 15%     | Nov. 28, 2025     | CS, LL            |
| Design Review 2                                | 6%      | Jan. 23, 2026     | D                 |
| Design Validation and Test Plan                | 13%     | Feb. 27, 2026     | D, ET,I           |
| Final Presentation and Prototype Demonstration | 20%     | TBD (Late March)  | CS,ET,D           |
| Final Report and Reflection                    | 30%     | Apr. 3, 2026      | CS, IESE          |

Note that the dates listed above are **tentative** and may be adjusted if needed. Marks will be assigned on the basis of method of analysis and presentation, correctness of solution, clarity and neatness.

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.**

#### 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 to enable an approximate even distribution among team members. **Project teams can be formed by 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 the course coordinator.**

**Each project must have an advisor or co-advisor who is a registered Professional Engineer (P.Eng. or provincial equivalent)**

#### **COURSE POLICIES:**

**Logbook:** 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 by the course coordinator and TA. The final reports will also include the faculty advisor. 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.

#### **LATE SUBMISSION POLICY:**

Advise the instructor if you are having problems completing the assignment on time prior to the due date of the assignment and be prepared to submit an Academic Consideration Request and provide documentation if requested by the instructor at:

<https://www.eng.uwo.ca/undergraduate/academic-consideration-for-absences.html>

If you are granted an extension, establish a due date with the instructor. The approval of the Chair of your Department is not required if assignments are completed prior to the last day of classes. Extensions beyond the end of classes must have the **documented** consent of the instructor, the department Chair and the Associate Dean, Undergraduate Studies.

**Documentation consent of the instructor is mandatory in the following cases:**

- Final Presentation and Prototype Demonstration requires formal supporting documentation for late submission.
- Design Review assessment requires formal supporting documentation for late submission.

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.

**ATTENDANCE:** Attendance is mandatory for all lectures.

**FACULTY OF ENGINEERING POLICIES:**

Students must familiarize themselves with the policies of the Faculty of Engineering

<https://www.eng.uwo.ca/electrical//pdf/2025-UG-Policy-and-Procedures.pdf>