Western University
Faculty of Engineering
Department of Electrical and Computer Engineering

ECE 3399B: Principles and Practices of Design of Electronic Systems

Course Outline 2023-24

Description: Exposure to the principles and practices of electrical engineering design through a project and case studies. This year the project will revolve around a mock up of a diffusion chamber and switched mode power supplies.

Academic Calendar Copy: Principles and Practices of Design of Electronic Systems is a third year design course in the Electrical Engineering Program. Topics include principles and practices of design of electronic systems through projects in the area of communications, microprocessors, control systems and signal processing.

Contact Hours: 1 lecture hours, 3 laboratory hours, 0.5 course.

Antirequisite: N/A

Pre-or Corequisite(s): ECE 3330A/B, ECE 3331A/B, ECE 3370A/B, ECE 3375A/B

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 Science 5%, Engineering Design 95%.

Required Textbook: none

Other Required References: none

Recommended References: none

General Learning Objectives (CEAB Graduate Attributes)

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

Notation: (I: Introduction, D: Developed, A:Advanced) at which the attribute is taught/Assessed.

Topics and Specific Learning Objectives

1. **Introduction to course projects**

   At the end of this section, students will

   a. Know what the nature of the project is

   b. Will have identified what are the key pieces of knowledge that they need to understand to successfully accomplish the project D1, I1

2. **Computer aided design and drafting**

Students will continue their training with computer drafting tools (Solidworks) from previous design courses

   At the end of this section, students will be able to:

   a. Draft simple solid designs and electrical circuits

   b. Simulate movement of designs ET2

3. Programmable Controller
   a) Introduction to PLC functions
   b) Relay ladder logic circuit
   c) PLC components
   d) Fundamental PLC programming
   e) Advanced PLC programming and Interfacing PA2, ET2

At the end of this section, students will be able to: Analyze and create PLC programs

4. **Theory and design of pulse width modulated circuits**

   At the end of this section, students will be able to:

   a. analyze a pulse width modulated circuit design

   b. design a switched mode power supply KB4

5. **Project management**

Students will be introduced to some of the tools used and best engineering practice for project management

   At the end of this section, students will be able to:

a. Discuss the principles of version control

b. Understand tools used in project management EPM2, EPM4

6. Standards

Students will get a brief introduction to standards relevant to electrical engineers such as Milspecs used in the aerospace industry and standards used in the power industry

At the end of this section, students will be able to:

a. Discuss case studies involving the standards setting process and specific power systems standards.

b. Students will be familiar with several of the relevant standards setting organizations. PR1, PR2, IESE2, LL2, EE3

7. Design and implement project

Students will familiarize themselves with the various stages of a design by:

Identifying the project needs, breakdown the project into individual modules, identify candidate solutions, evaluate the appropriateness of the candidates, select a final design and implement the design. They will go through the debugging process, improve the design and implement the improvements. PA2, PA3, D2, D3, D4, ET3, ITW2, CS1, CS2, CS3, IESE1. EE3, LL1

Evaluation

Course Component	Weight
Homework Assignments	10%
Project Proposal	10%
Project Review	15%
PCB Design	20%
Exam	20%
Final Project	25%

To obtain a passing grade in the course, a mark of 50% or more must be achieved on the final project. A final project mark < 50% will result in a final course grade of 48% or less.

Homework Assignments: There will be in lab tasks such as the drafting tutorials and a take home assignment..

Project Proposal: Due January 19th. Students will need to submit a choice of project and a preliminary description of how they will achieve the goals, at a level necessary to provide confidence they understand the project they have undertaken

Project Review: In the 5th week of the course the students will need to give a 15 minute presentation using power point or similar software to demonstrate understanding of how they will meet the technical objectives of their project and that preliminary decisions they have made are well founded. At this point 70% of a preliminary hardware design should be complete. A functional block diagram of code should be done. A written report is also required. 10 citations are required.

PCB Design : March 1st a final design is due. Feedback will be provided by March 5th and the final PCB submitted on March 8th. A **test plan** must be included.

Exam: There will be a 1.5 hour exam covering the theoretical aspects of the course

Final Project: The final project will involve both a physical demonstration of the students design, a written report/formal presentation of the design.

Late Submission Policy: Late submissions will receive a 10% per day deduction. This includes Saturdays and Sunday.

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.

Attendance: Any student who, in the opinion of the instructor, is absent too frequently from class, laboratory, or tutorial periods will be reported to the Dean (after due warning has been given). On the recommendation of the department, and with the permission of the Dean, the student will be debarred from taking the regular final examination in the course. Attendance during the PLC portion of the course is mandatory as this involves a hands on learning approach. Attendance during the labs devoted to project design is also required.

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 or a passage 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

Use of Electronic Devices: Is permitted

Use of Personal Response Devices ("Clickers"): Not Applicable

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.