

**DEPARTMENT OF ELECTRICAL AND COMPUTER
ENGINEERING**

ECE 2240A – Electronics Laboratory I

Course Outline Fall/Winter 2026

COURSE DESCRIPTION: This course provides students with hands-on experience that will enhance the concepts studied in the second-year courses on electrical circuits and familiarizes the student with the standard equipment in the undergraduate laboratories as well as circuit simulation software. At the end of this course, it is expected that each student will be able to operate the equipment and interpret the measurements and use a circuit simulation software package.

ACADEMIC CALENDAR:

[Link to the course description](#)

Laboratory experiments associated with [ECE 2205A/B](#), as well as laboratory experiments in instrumentation and measurement; the lecture component includes review of laboratory practice, health and safety issues, simulation software, data collecting methods; errors and their calculus; accuracy; averaging, signal conditioning, and data interpolation.

PRE OR COREQUISITES:

Prerequisite(s): [Computer Science 1026A/B](#) or [Engineering Science 1036A/B](#).

Corequisite(s): [ECE 2205A/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.

ANTIREQUISITES: none

CEAB ACADEMIC UNITS: Engineering Science 85%, Engineering Design 15%

INSTRUCTOR INFORMATION:

Name:

Office/Office Hours:

Phone:

Email:

CONTACT HOURS:

Timetable information is available at <https://draftmyschedule.uwo.ca/>.

Lectures and Tutorials occur weekly starting September 9. Laboratory sessions occur weekly starting September .

LECTURE:	
LAB:	
TUTORIAL:	

RECOMMENDED/REQUIRED TEXT: Course notes and lab equipment manuals available on OWL

RECOMMENDED/ REQUIRED SOFTWARE: Microcap 12 (circuit simulations); Altium (PCB layout and simulation) **RECOMMENDED RESOURCES/REFERENCES:**

1. David A. Bell, Electronic Instrumentation and Measurements, 2nd Edition, Prentice-Hall, 1994.
2. Joseph Carr, Elements of Electronic Instrumentation and Measurements, 3rd Edition, Prentice-Hall, 1996.
3. Albert D. Helfrick and William D. Cooper, Modern Electronic Instrumentation and Measurement Techniques, 2nd Edition, Prentice-Hall, 1990.
4. Larry D. Jones & A. Foster Chin, Electronic Instruments and Measurements, 2nd Edition, Prentice-Hall, 1991.
5. Alan S. Morris, Principles of Measurement and Instrumentation, 2nd Edition, Prentice-Hall, 1993.
6. J. David Irwin and R. Mark Nelms, Basic Engineering Circuit Analysis, 8th, 9th or 10th Edition, Wiley, 2011.

GENERAL LEARNING OBJECTIVES (CEAB GRADUATE ATTRIBUTES)

Knowledge Base	I	Engineering Tools	I	Impact on Society	
Problem Analysis	I	Individual & Teamwork		Ethics and Equity	
Investigation	I	Communication	I	Economics and Project Mgmt.	
Design	I	Professionalism		Life-Long Learning	

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:

The laboratory exercises, supplementary material and relevant manuals of instruments and software will be posted to the course website. Course material is taught in course lectures, tutorials, and laboratory sessions. Therefore, it is imperative that students attend these.

For circuit simulation, students are required to use the Micro-Cap 12 circuit simulation software and can be found of the OWL course site (for local installation) or alternatively available via *AppsAnywhere* cloud service in the Engineering Computer labs or for your personal Windows-based computer. This software will be needed in some of the laboratory exercises.

For PCB design, students are required to use the Altium Designer student license can be downloaded from: [Altium Designer Student License](#). Note: registration of a student account with Altium is required.

The laboratory equipment and software used in the course require using a Windows PC or laptop. It is student's responsibility to assure hardware compatibility and proper drivers for other types of computer devices, using Apple iOS or other operating systems.

UNITS: SI

COURSE TOPICS AND SPECIFIC LEARNING OUTCOMES: Topics covered in this course focus on the practical aspects of using the conventional test bench equipment to test and verify the operation of electronic circuits. Students will develop knowledge and skills related to the prototyping and testing of physical circuits and the components within. The learning outcomes will support the circuit analysis theory taught in the corequisite course.

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

Course Topics and Specific Learning Outcomes	CEAB Graduate Attributes Indicators
1: Building circuits on a circuit breadboard. At the end of this section, students will be able to: a. Understand layout of circuit breadboard b. Build a circuit on the circuit breadboard without mistakes.	ET1, I2, I3
2: Measuring resistance, voltage and current using digital and analog multimeters. At the end of this section, students will be able to: a. Connect a multimeter and select appropriate settings. b. Understands how to interpret measured values for both DC and AC signals	ET1, KB3

3: Assessing the errors in measurements and the effect of the input resistance of the instruments. At the end of this section, students will be able to: a. Estimate effects of input resistance on measurement. b. Calculate input resistance of the instruments and its effects on measurement accuracy.	ET2, I3
4: Using the MicroCap (SPICE based) circuit simulation software. At the end of this section, students will be able to: a. Build and edit parameters of the circuits in the MicroCap schematic simulator b. Set and run DC, AC and Transient Analysis of the simulated circuit	ET1, ET2
5: Measuring parameters of AC signal using laboratory function generator and digital oscilloscope. At the end of this section, students will be able to: a. Connect function generator and oscilloscope and select appropriate settings. b. Understand operation and main functions of the function generator and oscilloscope and how to interpret measured values for both DC and AC signals	KB3, ET1, ET2, I1, I2, I3
6: Study the characteristics and operation of basics op-amp circuits. At the end of this section, students will be able to: a. Calculate parameters and simulate in MicroCap non-inverting and inverting aamplifiers, and integrator circuit based OpAmp application. Build and edit parameters of the circuits in the MicroCap schematic simulator b. Build the circuits on the breadboard and measure their parameters.	KB3, ET1, ET2, I1
7: Study the characteristics and operation of first- and second order circuits. At the end of this section, students will be able to: a. Calculate parameters, simulate in MicroCap and investigate the natural and step response of an RC and RL circuits. Build the circuits on the breadboard and measure their parameters. b. Calculate parameters, simulate in MicroCap and investigate response of a second order RLC circuits. Build the circuits on the breadboard and measure their parameters.	ET1, PA1, PA2, I1, I2, I3
8: Design an electrical circuit by given parameters, design a Printed Circuit Board (PCB) using Altium software, solder and test the device, write a formal Report. At the end of this section, students will be able to:	ET2, CS3

- a. Design and calculate component values of an electrical circuit, simulate it in MicroCap and verify the design. Build the circuit on the breadboard and measure its parameters.
- b. Design a Printed Circuit Board using Altium software, solder components and test the completed device.

EVALUATION:

Name	% Worth	Assigned	Due Date	CEAB GAs ASSESSED
Labs (Total = 10)	50%			I1, I2, I3, ET1, ET2
PCB Project	20%			ET2, CS3
Final Examination	30%			

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.

COURSE POLICIES:

All work submitted must be of professional quality in the requested format. Material that is handed in dirty, illegible, disorganized, or in an unapproved format will be returned to the student for resubmission and the late submission penalty will take effect. An additional penalty of 10% may be deducted for poor grammar, incoherence, or lack of flow in the written reports.

LABORATORIES: Labs will run every week starting Week 2 (Sept 8th). There will be eight introductory labs covering (e.g. circuit breadboards, soldering, Digital Multimeters, oscilloscopes, function generators, etc) and two labs counted as Project. Students are required to purchase a lab kit that includes a portable oscilloscope- multimeter and PCB/components necessary to build a power distribution board for at-home lab exercise preparation. Test bench equipment used in the lab exercises and components required for the labs will be provided.

Attendance at all laboratory sessions is mandatory. Absence from any session, or a portion of a session, without permission will result in a zero assigned to the corresponding laboratory report. The teaching assistants will sign your lab report as testimony to your attendance. Students who arrive 20 min after the scheduled lab time without a legitimate reason, leave the lab early without permission from the teaching assistant, or miss the lab without a legitimate reason will receive a zero for the corresponding laboratory assignment. Students who miss a lab with academic consideration are required to contact the course instructor within 3 days for further instructions. Failure to do so will result in a zero mark for that lab.

Except where indicated, the laboratory exercises are to be completed in assigned pairings of students. If a lab section has an odd number of students or one member of the pairing is absent, then a student may be required to perform the exercise on their own.

A minimum average of 60% across all laboratory exercises is required to pass the course.

FINAL EXAMINATION: The final exam will take place during the regular examination period. The final exam will have a take home (simulation of a circuit question) distributed 24 hours before the exam time and a 30 minutes in lab experiment in a group decided before the exam. Only simple, nonprogrammable calculators are allowed.

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

If the above conditions are not met, your final grade cannot be greater than 48%. Students who have failed this course (i.e., final average < 50%) must repeat all components of 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 consent of the instructor, the department Chair and the Associate Dean, Undergraduate Studies. Documentation is mandatory.

All lab or project report submissions will be penalized by 30% of the available marks per day for late submission. Deliverables submitted more than 3 days late will not be accepted.

ATTENDANCE: Attendance is mandatory for all lab exercise and project laboratory sessions. Attendance at lectures and tutorials is not mandatory, but strongly encouraged.

ABSENCE FROM MANDATORY COURSE COMMITMENTS: Students must familiarize themselves with the Policy on **Academic Consideration for Absences:**

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

I. Missed/Late Accommodation Policy

1. Students missing a test/assignment/lab or examination you will report the absence by submitting Academic Consideration Request form through [STUDENT ABSENCE PORTAL](#).
2. Documentation must be provided as soon as possible.
3. Forged notes and certificates will be dealt with severely. To submit a forged document is a scholastic offence.

II. Exam Accommodation

1. If you are unable to write a final examination, report your absence using the Academic Consideration Request Form through [STUDENT ABSENCE PORTAL](#).

2. Be prepared to provide the Undergraduate Services Office with supporting documentation (see next page for information on documentation) the next day, or as soon as possible (in cases where students are hospitalized). **The following circumstances are not considered grounds for missing a final examination or requesting special examinations: common cold, headache, sleeping in, misreading timetable and travel arrangements.**
3. In order to receive permission to write a Special Examination, you must obtain the approval of the Chair of the Department and the Associate Dean and in order to apply you must submit an the Academic Consideration Request Form through [STUDENT ABSENCE PORTAL](#).
PLEASE NOTE: It is the student's responsibility to check the date, time and location of the Special Examination.

III. LATE ASSIGNMENTS

IV. Medical Accommodation

1. Requests for Academic Consideration Request Form through [STUDENT ABSENCE PORTAL](#).
2. Requests for academic consideration must include the following components:
 - a. Self-attestation signed by the student (*This is only accepted for the first/one absence*)
 - b. Medical note. Forged notes and certificates will be dealt with severely. To submit a forged document is a scholastic offence.
 - c. Indication of the course(s) and assessment(s) affected by the request
 - d. Supporting documentation as relevant
3. Requests without supporting documentation are limited to one per term per course.
4. **Students must request academic consideration as soon as possible and no later than 48 hours after the missed assessment.**
5. Once the request and supporting documents have been received and reviewed, appropriate academic consideration, if granted, shall be determined by the instructor in consultation with the academic advisor, in a manner consistent with the course outline.

Academic consideration may include extension of deadlines, waiver of attendance requirements for classes/labs/tutorials, or re-weighting of course requirements. Some forms of academic consideration, such as arranging Special Examinations, assigning a grade of Incomplete, or granting late withdrawals without academic penalty, may only be granted by the Academic Advising office of the Faculty of Registration.

6. **An instructor may deny academic consideration for any assessment that is not required in the calculation of the final grade** (e.g., "8 of 10 quizzes"). Assessment flexibility must be indicated on the course outline.
7. **An instructor may deny academic consideration relating to the timeframe submission of work where there is already flexibility in the submission timeframe** (e.g., 72-hour submission window). This assessment flexibility must be indicated on the course outline.

V. Religious Accommodation

When scheduling unavoidably conflicts with religious holidays, which (a) require an absence from the University or (b) prohibit or require certain activities (i.e., activities that would make it impossible for the student to satisfy the academic requirements scheduled on the day(s) involved), no student will be penalized for absence because of religious reasons, and alternative means will be sought for satisfying the academic requirements involved. If a suitable arrangement cannot be worked out between the student and instructor involved, they should consult the appropriate Department Chair and, if necessary, the student's Dean.

It is the responsibility of such students to inform themselves concerning the work done in classes from which they are absent and to take appropriate action.

VI. Academic Integrity

In the Faculty of Engineering, we encourage students to create a culture of honesty, trust, fairness, respect, responsibility, and courage, befitting the professional degree you are pursuing.

Please visit [Academic Integrity Western Engineering](#) for more information

VII. Academic Offences

Plagiarism means using another's work without giving credit. The university has rules against plagiarism and other scholastic offences. Western Engineering has a zero-tolerance policy on plagiarism. The minimum penalty is zero on the course work and a repeat offence will earn you zero on the course. A third offence may lead to expulsion from the university.

[Scholastic Discipline for Undergraduate Students & Cheating, Plagiarism and Unauthorized Collaboration: What Students Need to Know](#)

Students must write their reports, 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

VIII. Faculty of Engineering AI Policy

The use of generative Artificial intelligence (GenAI) tools won't be discouraged in the Faculty of Engineering. As we pride ourselves on building the future we can't hide from the use of GenAI tools to contribute to the understanding of the course materials. However, the use of GenAI tools in any assignment or contribution during the course will have to be disclosed, as a resource.

GenAI tools use won't be permitted in any type of examination or other assessments where the faculty have prohibited their use. If use of GenAI tools is detected by the instructor in these instances, academic offences penalties might be imposed against the student.

IX. Use of English Policy

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 except for 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.

X. Accessibility

Western is committed to achieving barrier free accessibility for persons with disabilities studying, visiting and working at Western. As part of this commitment, there are a variety of services, groups and committees on campus devoted to promoting accessibility and to ensuring that individuals have equitable access to services and facilities. To help provide the best experience to all members of the campus community, please visit the [Accessibility Western University](#) for information on accessibility- related resources available at Western.

Students with disabilities may arrange for academic accommodation at Western. For a more detailed explanation, please visit [Academic Support & Engagement -Academic Accommodation](#).

XI. Inclusivity, Diversity, and Respect

The Faculty of Engineering at Western University is committed to creating equitable and inclusive learning environments that value diverse perspectives and experiences. We recognize that university courses often marginalize students based on social identity characteristics such as, but not limited to, Indigeneity, race, ethnicity, nationality, ability, gender identity, gender expression, sexuality, age, language, religion, and socioeconomic status. Understanding this, we strive to facilitate equitable experiences and inclusion within the classroom by respecting and integrating multiple ways of knowing, being, and doing. Please visit the [Office of Equity, Diversity and Inclusion](#).

XII. Health and Well-Being

- [Health & Wellness Services – Students](#) - Offers appointment-based medical clinic for all registered part- time and full-time students.
- [Mental Health Support](#) - Provides professional and confidential services, free of charge, to students needing assistance to meet their personal, social and academic goals. Services include consultation, referral, groups and workshops, as well as brief, change-oriented psychotherapy.
- [Crisis Support](#) - For immediate assistance, please visit Thames Hall Room 2170 or call 519-661-3030. The crisis clinic operates between 11:00 am - 4:30 pm. For after-hours crisis support, click [here](#).
- [Gender-Based Violence and Survivor Support](#) - Western [is committed to reducing incidents of gender-based and sexual violence](#) and providing compassionate support to anyone who has gone through these traumatic events. If you have experienced gender-based or sexual violence (either recently or in the past), you will find information about support services for survivors, including emergency contacts, [here](#). To connect with a case manager or set up an appointment, please contact support@uwo.ca.

Important Contacts

[Engineering Undergraduate Services](#)

[Electrical and Computer Engineering](#)

[Office of the Registrar/Student Central](#)

Important Links

- [WESTERN ACADEMIC CALENDAR](#)
- [ACADEMIC RIGHTS AND RESPONSIBILITIES](#)
- [ENGINEERING PROGRESSION REQUIREMENTS AND ACADEMIC REGULATIONS](#)
- [UNIVERSITY STUDENTS' COUNCIL \(USC\) - SERVICES](#)
- [IMPORTANT DATES AND DEADLINES](#)

- [ACADEMIC CONSIDERATION FOR MEDICAL ILLNESS - UNDERGRADUATE STUDENTS](#)
- [ACCOMMODATIONS FOR RELIGIOUS HOLIDAYS](#)
- [SCHEDULING OF ASSIGNMENTS, TESTS, AND EXAMINATIONS](#)

- [STUDENT FORMS](#)
- [OFFICE OF THE REGISTRAR](#)
- [RETENTION OF ELECTRONIC VERSION OF COURSE
OUTLINES \(SYLLABI\)](#)
- [ACADEMIC APPEALS](#)
- [STUDENT ABSENCE PORTAL](#)