

ELEC1043: CIRCUITS

Introduction

This course covers the fundamentals of electrical engineering and circuit analysis, including voltage, current, power, Ohm's law, and passive elements. You'll learn key methods like Loop and Nodal analysis, Thevenin's and Norton's theorems, and Source Transformation. Topics also include frequency response, capacitors, inductors, passive filters, and circuit design with simulation, preparing you for advanced applications.

Course Description and Requirements

Electrical Quantities (Voltage, Charge, Current, Power). Conservation of charge and energy. Mathematical models of simple devices. Elementary circuit theory for passive elements. Thevenin's and superposition theorem. Signal filtering and amplification. Time and frequency domain. Circuit design and simulation.

Precludes additional credit for ECOR 1052.

Includes: Experiential learning activity in the form of Labs

Prerequisite(s): This course may not be taken concurrently with ESLA 1300 or ESLA 1500.

Lectures: Lectures three hours per week.

Laboratory: Laboratories three hours per week.

Instructor

Professor: Tashfeen Karamat

Email: tashfeen.karamat@carleton.ca

Course Webpage: on Brightspace

Office: 4526 EDC

Textbook

Lecture notes will be provided, which will be sufficient for this course. However, the following book is a useful reference for students who wish to explore certain topics in more depth.

Reference Book: NOT REQUIRED but may prove useful: Basic Engineering circuit analysis. Irwin, J. and Nelms, R. Wiley. 11th/12th Edition.

Price: C\$121.37

Required software

Multisim Live software (from National Instruments NI) will be used for the labs. This is an online circuit simulator for which no installation is required. You need to get the "Standard" plan which costs USD 1.99/month. You just have to keep this account for about a month and half so make sure to cancel the subscription after your last lab has been submitted.

Lecture Outline

Lectures will be “In-person”. The following is a breakdown of the topics that will be covered each week. There may be a slight variation in their order to adjust for any unforeseen circumstances:

Week 1: Introduction, Ohm’s Law, KVL, KCL.

Week 2: Single-loop and Single-node circuits.

Week 3: Multi-node analysis, multi-loop analysis.

Week 4: Thevenin’s and Norton’s theorems, Maximum power transfer. Source transformation and Superposition

Week 5: Introduction to AC, basics of Frequency response,

Week 6: Passive high-pass and band-pass filters, superposition, and source transformation.

Laboratory

All Labs will be “In-person”. There will be 5 labs (including Lab #0), and 4 Pre-Labs related to each lab as per schedule and location posted on Brightspace. There is no Pre-Lab for Lab #0, and it does not carry any marks, however it is critical for successful and timely completion of subsequent labs.

Pre-Labs

The pre-labs will be evaluated prior to the start of each lab to ensure students understand the requisite knowledge prior to performing each experiment. The prelab will be required to be completed prior to starting each lab (in the form of an online quiz).

Labs

- Lab attendance is a mandatory requirement of the course. A TA will take attendance at each lab session.
- Labs will be performed in groups of 2 students.
- There are 5 labs as follows:
 - Lab 0: Introduction to Simulation Software & Lab Procedure and Tools (No Pre-lab and not graded)
 - Lab 1: Introduction to Instruments
 - Lab 2: Introduction to Circuit Simulation
 - Lab 3: Kirchhoff’s Laws & Loop/Nodal Analysis
 - Lab 4: Thevenin’s Theorem & Max Power Transfer
- Labs are 3 hours in duration and will be held in *Room ME4390*. Labs will be held according to the schedule shown on the course module in Brightspace. You must attend your lab in the session you are registered. Changing sessions is not allowed.
- As current circumstances do not allow for makeup labs to be offered: Should a student miss a single lab due to any reason the weight of that report will be moved to the remaining three reports. Therefore, your lab report grade will take the best 3 of the 4 total reports. Lab attendance is a mandatory requirement of the course (to be eligible for a grade for that lab), which will be ensured during lab “Check-out”. A grade of ‘0’ in lab Check-out means you will get ‘0’ in your lab report irrespective of your lab report grade.
- Due to accreditation requirements, **lab exemptions will not be granted for any reason**. If you are repeating the course, you must redo all the labs. This means doing all the Pre-Labs, attending all the lab sections, and submitting all the reports. You may not resubmit any work that you have submitted in previous classes as it is considered a form of plagiarism.

Lab Reports

- The lab reports will be evaluated to ensure students performed and understood the experiment as required and recorded or calculated all necessary values.
- A single Lab Report per group is to be submitted online using the relevant Lab page on Brightspace before the deadline.

- Lab reports are to be submitted 3 days after the start of the lab. The exact submission deadline will be mentioned on the Brightspace Lab page.
- If the lab report is submitted after the deadline but within 24 hours, it will lose 15% of the marks.
- If it is further delayed for another 24 hours, it will lose 30% of the marks. After that period, the individual will get no marks for the lab.

For detailed instructions about Pre-Lab and Labs, see "Pre-Lab and Lab Instructions" in "Lab Experiments" section of your main Brightspace course page.

Final Exam

- The final exam will evaluate student understanding of all course concepts. As soon as the date of the final exam is confirmed by Scheduling and Examination Services (SES) it will be communicated to you by SES, and you can find it on "<https://carleton.ca/ses/exam-schedule>". Final exam will take place outside of class time (which can include Friday evening, Saturday, or Sunday).
- The final examination is for evaluation purposes only and will not be returned to students. You will be able to make arrangements with the instructor or with the department office to see your marked final examination after the final grades have been made available. This should be done no later than 3 days after the marks are posted.
- The final exam will be Closed-Book and Closed-Notes, and no reference materials are allowed. Formula sheet will be provided along with the exam.
- No electronic device except for non-graphing and non-programmable calculators is permitted in the final exam.

Exam format and proctoring statement

The final exam will be proctored and administered on campus. The exam will be paper-based, and answers will need to be written/indicated on Scantron sheets.

Deferred Final Examinations

Students who are unable to write the final examination because of a serious illness/emergency or other circumstances beyond their control may apply for accommodation by contact the Registrar's office. Consult the Section 4.3 of the University Calendar

(<https://calendar.carleton.ca/undergrad/regulations/academicregulationsoftheuniversity/examinations/>)

Evaluation and Grading Scheme

The cumulative course grade will be determined as follows:

Component	Weight
Pre-labs	10%
Lab Reports	25%
Final Exam	65%

- To pass the course, students must achieve satisfactory performance during the term as well as in the final exam.
- Satisfactory performance during the term is completion of the lab experiments (including checking out of each lab) with a combined average grade of >40% on all term work (All grades excluding the final exam).

- Students who fail the final exam (an exam grade of less than 50%) will receive a course grade of F, regardless of their marks in the other components. For students who pass the final exam, a numeric mark out of 100 will be calculated by weighing the course components as shown in the table above.
- The minimum passing grade for this course is C-. Any grade below this will be recorded as an F in the final grade per Faculty of Engineering and Design policy for ECOR 104x courses.

Learning Outcomes

By the end of this course, students should:

- Learn to analyze electrical circuits using techniques such as loop and nodal analysis, Norton and Thevenin analysis and superposition.
- Learn the basics of capacitors and inductors.
- Learn to analyze and design lowpass, highpass and bandpass filters.
- Gain experience performing electrical circuit simulation.
- Familiarize themselves with electrical laboratory hardware such as function generators and oscilloscopes.
- Learn to work in a group environment.

Graduate Attributes

The Canadian Engineering Accreditation Board requires graduates of undergraduate engineering programs to possess 12 attributes: [Graduate-Attributes.pdf \(engineerscanada.ca\)](#) or GA's. Courses in all four years of our programs evaluate students' progress towards acquiring these attributes. Aggregate data (typically, the data collected in all sections of a course during an academic year) is used for accreditation purposes and to guide improvements to programs. Some of the assessments used to measure GAs may also contribute to final grades; however, the GA measurements for individual students are not used to determine the student's year-to-year progression through the program or eligibility to graduate. Accreditation metrics are based on courses common to all students in a program.

This following list provides the GAs that will be measured in this course, along with the indicators that are intended to develop and assess these attributes.

Graduate Attribute and Level	Indicators or Area for Specialization	Methods used for Evaluation
GA-1 Knowledge base for Engineering Level I	1.3 - Fundamental engineering concepts	Final exam
GA-2 Problem Analysis Level I	2.3 - Use of assumptions 2.4 - Interpreting the solution - validity of results	Dedicated exam questions Lab reports
GA-5: Engineering Tools Level I	5.3 - Tools for design, experimentation, simulation, visualization or analysis. 5.5 - Limitations of such tools and the assumptions inherent in their use	Lab reports Lab reports

Self-Declaration form and Deferred Term work

Students who claim illness, injury or other extraordinary circumstances beyond their control as a reason for missed term work are held responsible for immediately informing the instructor/Head TA concerned and for submitting a self-declaration form no later than three (3) days after the date/deadline of term work including test/midterm, labs, assignments. Any alternate arrangements made with the instructor for submission of term work should be made as soon as possible but within 3 days of the missed due date. If this is not possible after discussion with the instructor, alternate arrangements must be made before the last day of classes in the term as published in the academic schedule.

Consult with the instructor/Head TA no later than 3 days after any missed course work or midterm examination.

Academic Integrity and Plagiarism

a) Please consult the Faculty of Engineering and Design information page about the Academic Integrity policy and our procedures: <https://carleton.ca/engineering-design/current-students/fed-academic-integrity>.

Violations of the Academic Integrity Policy will result in the assignment of a penalty such as reduced grades, the assignment of an F in a course, a suspension or expulsion.

b) One of the main objectives of the Academic Integrity Policy is to ensure that the work you submit is your own. As a result, it is important to write your own solutions when studying and preparing with other students and to avoid plagiarism in your submissions. The University Academic Integrity Policy defines plagiarism as “presenting, whether intentionally or not, the ideas, expression of ideas or work of others as one’s own.” This includes reproducing or paraphrasing portions of someone else’s published or unpublished material, regardless of the source, and presenting these as one’s own without proper citation or reference to the original source.

Examples of violations of the policy include, but are not limited to:

- Any submission prepared in whole or in part, by someone else.
- Using another’s data or research findings without appropriate acknowledgment.
- Submitting a computer program developed in whole or in part by someone else, with or without modifications, as one’s own.
- Failing to acknowledge sources of information through the use of proper citations when using another’s work and/or failing to use quotations marks; and
- Unless explicitly permitted by the instructor in a specific course, the use of generative AI and similar tools to produce assessed content (such as text, code, equations, images, summaries, videos, etc.).

Academic Accommodations

You may need special arrangements to meet your academic obligations during the term. For an accommodation request the processes are as follows:

Pregnancy obligation

Contact us with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For accommodation regarding a formally-scheduled final exam, you must complete the Pregnancy Accommodation Form ([click here](#)).

Religious obligation

Contact us with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details [click here](#).

Academic Accommodations for Students with Disabilities

The Paul Menton Centre for Students with Disabilities (PMC) provides services to students with Learning Disabilities (LD), psychiatric/mental health disabilities, Attention Deficit Hyperactivity Disorder (ADHD), Autism Spectrum Disorders (ASD), chronic medical conditions, and impairments in mobility, hearing, and vision. If you have a disability requiring academic accommodations in this course, please contact PMC at 613-520-6608 or pmc@carleton.ca for a formal evaluation. If you are already registered with the PMC, contact your PMC coordinator to send us your Letter of Accommodation at the beginning of the term, and no later than two weeks before the first in-class scheduled test or exam requiring accommodation (if applicable). After requesting accommodation from PMC, contact us, if needed, to ensure that accommodation arrangements are made.

You should request your academic accommodations in the [Ventus Student Portal](#), for each course at the beginning of every term. For in-term tests or midterms, please request accommodation at least two (2) weeks before the first test or midterm.

Please consult the [PMC website](#) for the deadline to request accommodations for formally-scheduled exams (if applicable).

Survivors of Sexual Violence

As a community, Carleton University is committed to maintaining a positive learning, working and living environment where sexual violence will not be tolerated, and where survivors are supported through academic accommodations as per Carleton's Sexual Violence Policy. For more information about the services available at the university and to obtain information about sexual violence and/or support, visit:

<https://carleton.ca/equity/sexual-assault-support-services>

Accommodation for Student Activities

Carleton University recognizes the substantial benefits, both to the individual student and for the university, which result from a student participating in activities beyond the classroom experience. Reasonable accommodation will be provided to students who compete or perform at the national or international level. Contact us with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist: <https://carleton.ca/senate/wp-content/uploads/Accommodation-for-Student-Activities-1.pdf>

Advising and Counselling services

Engineering Academic Advising

The Engineering Academic Support Service : <https://carleton.ca/engineering-design/current-students/undergrad-academic-support/> assists undergraduate engineering students with course selection, registration, and learning support from first-year through to graduation.

Academic Advisors Contact : <https://carleton.ca/engineering-design/current-students/undergrad-academic-support/undergraduate-advisors/>

Student Mental Health Service

As a university student you may experience a range of mental health challenges that significantly impact your academic success and overall well-being. Carleton's Wellness Services Navigator <https://wellness.carleton.ca/navigator/> is designed to help students connect with mental health and wellness resources. If you need to talk to someone, please reach out for assistance: <https://carleton.ca/health/emergencies-and-crisis/>.

Learning and Working Environment

The University and all members of the University community share responsibility for ensuring that the University's educational, work and living environments are free from discrimination and harassment. Should you have concerns about harassment or discrimination relating to your age, ancestry, citizenship, colour, creed (religion), disability, ethnic origin, family status, gender expression, gender identity, marital status, place of origin, race, sex (including pregnancy), or sexual orientation, please contact the Department of Equity and Inclusive Communities at equity@carleton.ca

We will strive to create an environment of mutual respect for all through equity, diversity, and inclusion within this course. The space which we work in will be safe for everyone. Please be considerate of everyone's personal beliefs, choices, and opinions.

General Regulations

Attendance

Students are expected to attend all lectures and lab periods In-Person. Lab attendance is a mandatory requirement of the course. The University requires students to have a conflict-free timetable. For more information, see the current *Undergraduate Calendar, Academic Regulations of the University, Section 1.2, Course Selection and Registration and Section 1.5, Deregistration*.

Health and Safety

Every student should have a copy of our Health and Safety Manual. A PDF copy of this manual is available online: <http://sce.carleton.ca/courses/health-and-safety.pdf>

Appeal of Grades

The processes for dealing with questions or concerns regarding grades assigned during the term and final grades is described in the *Undergraduate Calendar, Academic Regulations of the University, Section 2.7, Informal Appeal of Grade and Section 2.8, Formal Appeal of Grade*.

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