COURSE OUTLINE

ECOR1043: CIRCUITS – FALL 2024
DEPARTMENT OF ELECTRONICS
CARLETON UNIVERSITY

1 INSTRUCTOR INFORMATION

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2 HEAD TA INFORMATION:

Name: TBA
Email: TBA

3 COURSE MODE OF DELIVERY

Course will be delivered In-Person, which includes all the lectures, labs, quizzes, and exams.

4 COURSE DESCRIPTION

ECOR1043
Circuits

Basic electrical quantities (Voltage, Charge, Current, Power) and Ohm's law. Elementary circuit theory for passive elements including Loop and Nodal analysis. Thevenin's, Norton's, Source Transformation and Superposition theorems. Basics of frequency response, capacitors, and inductors. Fundamentals of passive filters (low-pass, high-pass and band-pass). Circuit design and simulation.

Precludes additional credit for ECOR 1052.

Prerequisites: This course may not be taken concurrently with ESLA 1300 or ESLA 1500.

Students who have not satisfied the prerequisites for this course must either withdraw from the course or obtain a prerequisite waiver by visiting the Engineering Undergraduate Academic Support Office.

5 COURSE OBJECTIVES

This course will introduce students to various engineering subjects such as:

- An introduction to electrical system design & simulation
- Applications for theoretical knowledge such as voltage dividers, max power transfer
- Electrical engineering hardware
- Electrical specifications
- Cooperative group work
- Engineering Documentation and technical writing

6 ACCREDITATION UNITS

Math	Natural Science	Complementary Studies	Engineering Science	Engineering Design
	I		70%	

7 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.

8 COURSE CONTENT

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	Topics	Description
1	Introduction, Ohm's Law, KVL, KCL.	Charge, current, energy, voltage, power, circuit elements, Resistance, Ohm's law, KCL, KVL
2	Single-loop and Single-node circuits.	Single-loop analysis, voltage division, multi-source, multi-resistance networks, resistors in series. Single-node analysis, current division, multi-source/ multi-resistance networks.
3	Multi-node analysis, Multi-loop analysis.	Analysis of multi-node, multi-loop and multi-source circuits.
4	Additional Analysis Techniques. Source transformation and Superposition	Thevenin's and Norton's theorems, Maximum power transfer. Introduction to the concept of Source transformation and its use to simplify circuit analysis. Basics of Superposition and its use to simplify the analysis of the circuits with multiple sources.
5	Introduction to AC Basics of Frequency response,	Introduction to AC signals, sinusoids, complex numbers, concept of impedance, basics of capacitors, inductors and their impedance. Basics of frequency response, transfer function, decibels. Concepts of creating Bode plots and introduction to various passive filters.
6	Passive high-pass and band-pass filters, superposition, and source transformation.	Utilizing the frequency response of inductors and capacitors to create passive first-order high-pass, low-pass, and band-pass filters. Examples of how to create Bode plots for various passive filters.

9 Reference Material

- *Lecture Notes:* Lecture notes will be provided, which will be sufficient for this course.
- *Reference Book*: NOT REQUIRED but may prove useful: Engineering circuit analysis. Irwin, J. and Nelms, R. Wiley. 11th/12th Edition.

10 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.

11 Evaluation and Grading Scheme

The overall grade will be calculated 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.

12 BREAKDOWN OF COURSE REQUIREMENTS

12.1 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).

12.2 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.

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.

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

12.3 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.

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/)

13 GRADUATE ATTRIBUTES (GA'S)

The Canadian Engineering Accreditation Board requires graduates of undergraduate engineering programs to possess 12 attributes.[1] 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 our 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.

This table lists the GAs that will be measured in this course, along with the learning outcomes that are intended to develop abilities related to these attributes.

Graduate Attributes	Instructional Level[2]	Learning outcomes (listed in the previous section)
1.3 - Fundamental engineering concepts	I	1-3
2.3 - Use of assumptions	I	1
2.4 - Interpreting the solution - validity of results	I	1 - 3
5.3 - Tools for design, experimentation, simulation, visualization or analysis.	I	1, 2 & 4
5.5 - Limitations of such tools and the assumptions inherent in their use	I	1, 2 & 4

[1] Criterion 3.1, *2018 Accreditation Criteria and Procedures*, Canadian Engineering Accreditation Board, November 2018.

[2] The instructional level of course content related to graduate attributes is classified by the content-level codes I (Introduced), D (Developed) and A (Applied). These codes are defined in A Guide to Outcomes-Based Criteria, Version 1.25, Canadian Engineering Accreditation Board, 1 March 2015.

14 General Regulations

14.1 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.*

14.2 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

14.3 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 concerned and for making alternate arrangements with the instructor and in all cases this must occur no later than three (3) days after the term work was due. The alternate arrangement must be made before the last day of classes in the term as published in the academic schedule.

Instructors can require (or not) the student to submit the self-declaration form. Include the following statement if you require the student to submit a completed self-declaration form:

Consult with the instructor no later then 3 days after any missed course work or midterm examination.

or

Contact the instructor with the completed self-declaration form no later than 3 days after the date/deadline of term work including test/midterm, labs, assignments.

14.4 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.*

14.5 Copyright

The materials (including the course outline and any slides, posted notes, videos, labs, project, assignments, quizzes, exams and solutions) created for this course and posted on this web site

are intended for personal use and may not be reproduced or redistributed or posted on any web site without prior written permission from the author(s).

14.6 Advising and Counselling services

14.6.1 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/

14.6.2 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/.

14.7 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.

14.8 Academic Integrity and Plagiarism

1) 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.

2) 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 acknowledgement;
- submitting a computer program developed in whole or in part by someone else, with or without modifications, as one's own; and
- failing to acknowledge sources of information through the use of proper citations when using another's work and/or failing to use quotations marks.

3) Generative Artificial Intelligence (AI): Use of generative AI tools (such as ChatGPT) in course work is prohibited unless explicitly authorized by the course instructor for specific elements of the course. Submission of AI generated work without authorization may lead to an academic integrity investigation.

14.9 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: write to me 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: write to me 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 me 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, meet with me to ensure accommodation arrangements are made. Please consult the PMC website for the deadline to request accommodations for the formally-scheduled exam (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, that 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. Write to me 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