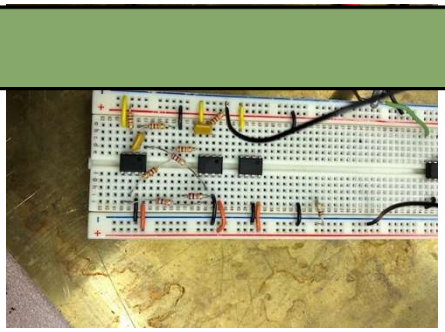
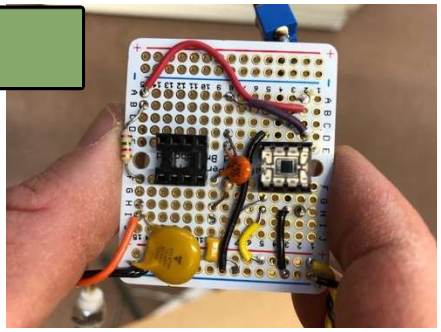
# ELEC 2501 Fall 2024

## Instructors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|---|---|---|
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**Textbook:** J. D. Irwin and R. M. Nelms, Basic Engineering Circuit Analysis, 12th Ed., Wiley, 2021

**Prerequisites:** MATH 1005 and (PHYS 1004 or PHYS 1002) are pre-requisites and students without them will be deregistered.

**Course Outline:**

Properties of Signals
Basic circuit elements: voltage and current sources Kirchhoff's laws, linearity, superposition.
Thevenin and Norton's theorems. Circuit simplification.
AC steady-state analysis: impedance, admittance, phasors, frequency response.
Transient response of RL and RC circuits: form of response,
initial and final conditions
RLC circuits: resonance

**Evaluation Scheme:**

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|---|---|
| Labs | 20% |
| Assignment | 5% |
| PA Quizzes | 15% |
| Midterms (1) . | 20% |
| Final | 40% |

- Students need to obtain a minimum of 50% in their combined term mark (labs / PA quiz / assignment / midterm) otherwise a grade of F could be assigned.
- A grade of at least 50% on the final exam is required to be eligible to pass the course.

- Students **must complete all labs** to be eligible to pass, otherwise a grade of F can be assigned.
- If the midterm is missed due to a valid reason, the weight of the midterm is transferred to the final. A make-up mid-term will not be granted.

**Midterm**: There will be one midterm in the course, 90 minutes in duration. The date for the midterm is:

- Midterm: Friday October 18th 6:00 pm EST

If there are any conflicts or concerns with this date/time please contact the course instructors ASAP.

**Internet Connections**: Lectures for Fall 2024 will be in-person. Course material will be posted on-line and it is essential that students have a reliable high speed internet connection to upload and submit their course work on time.

**Laboratories**:

All Laboratories for ELEC2501 are being delivered in a completely in-person format. All laboratories will take place in **Mackenzie 4195**. Each student is required to independently complete and submit all laboratory reports. Lab reports should convey all data, calculations, graphs etc. and the necessary conclusions and discussions should be added at the end. Ensure you know how to do this efficiently before your first lab. Students have the choice of program to prepare their reports and data but reports must be neat and legible otherwise a discretionary deduction may be applied. Lab reports are due at Midnight on the day of your lab section, please allow yourself enough time to check that you have submitted the correct file. Late reports will not be accepted and will receive a grade of zero.

Lab attendance is mandatory, TAs will be taking attendance and records will be maintained for the term. **Lab exemptions are not granted under any circumstances** for accreditation purposes, students completing the course must **complete all labs** and prepare original laboratory reports. Unexcused lab absences must still be completed to be eligible to pass the course.

Additionally, the following lab policies must absolutely be adhered to, **no exceptions!**

- Students must attend their lab session on time.
- Students must complete their lab in their allotted time.
- Students must always properly log out of their workstation when done.
- All reports are to be submitted as a single .PDF file online.
- **In the case of a missed lab for medical reason or accepted excused absence, a request for a makeup lab (with reason provided) must be made within 48 hrs of the missed lab. Failure to do this will result in a grade of zero on the missed lab and an unsatisfactory completion of the course requirements. Makeup lab requests should be directed to the course instructor.**

**PA**:
There are 5 PA sessions for this course throughout the term and they will occur on a bi-weekly basis alternating with labs. The PA sessions will be held in person in the room listed on Carleton Central. PA session questions are assigned out of J. D. Irwin and R. M. Nelms, Basic Engineering Circuit Analysis 12th edition. You will be required to have the assigned textbook to complete this. The last 50 minutes of each PA session will consist of an in-person, written quiz to be delivered and graded by your TA. Quizzes are to be completed individually and will be closed book. Your final quiz grade will be taken as the **best 4 of 5 quizzes** completed during the term. **Make-up quizzes will not be granted for any reason.**

**Assignment:**
There will be a 1 Assignment for the course. However, it will be broken up into 2 parts that are due at the same time. The Assignment will be posted on November 13th and will be due on November 17th at 11:59pm.

**Final Examination:**
The final exam will be a 3 hour in-person exam. Time and location will be arranged by Scheduling and Examination Services during the fall final exam period in December.
The final exam is for evaluation purposes only and will not be returned to the student.

**Academic Accommodation**:
You may need special arrangements to meet your academic obligations during the term. For more details visit the Equity Services website: http://www.carleton.ca/equity/. For an accommodation request sthe processes are as follows:

1. Pregnancy obligation: write to the course instructor 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.
2. Religious obligation: write to the instructor 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.
3. Academic Accommodations for Students with Disabilities: The Paul Menton Centre for Students with Disabilities (PMC) (https://carleton.ca/pmc for more information) 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, 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 your Letter of Accommodation as early as possible. Feel free to contact the instructors to ensure accommodation arrangements are made. Please consult the PMC website for the deadline to request accommodations for the formally-scheduled exam (if applicable) at https://carleton.ca/pmc/registering-with-pmc/.

**Learning Outcomes:**

- Use appropriate SI units for currents, voltages and circuit elements
- Define voltage, current, power and their relationships
- Define and apply Ohm's law
- Analyze single-loop and single-node-pair circuits

- Determine the equivalent resistance of a network
- Transform wye resistor network into delta resistor network and vice versa
- Apply voltage and current division in circuits
- Analyze electric circuits to determine voltage and currents in the network
- Calculate currents and voltages in a circuit using loop analysis or nodal analysis
- Analyze electrical circuits using the principle of superposition
- Calculate Thevenin and Norton equivalent circuits for linear circuits
- Apply maximum power transfer theorem to determine optimal load
- Use circuit models for inductors and capacitors to calculate voltages, currents and powers
- Calculate voltages and currents in first-order transient circuits
- Perform phasor and inverse phasor transformations Draw phasor diagrams
- Calculate equivalent impedance and admittance for circuits consisting of basic circuit elements
- Apply circuit analysis techniques to frequency-domain circuits
- Calculate instantaneous, average, real, reactive and complex power and power factor in ac circuits
- Calculate average and RMS value for a periodic waveform
- Calculate the maximum average power transfer for a load in an ac circuit
- Sketch Bode plots for a network function
- Analyze series and parallel resonant circuits to determine voltages and currents in circuit

**Graduate Attributes**: An institution must demonstrate that graduates of its programs possess the attributes described below. In addition, the institution must implement and employ processes to demonstrate that program outcomes are being assessed in the context of these attributes, and that the results of such assessments will be applied to the further development of programs. The graduate attributes are:

1. A knowledge base for engineering: Demonstrated competence in university level mathematics, natural sciences, engineering fundamentals, and specialized engineering knowledge appropriate to the program.

2. Problem analysis: An ability to use appropriate knowledge and skills to identify, formulate, analyze, and solve complex engineering problems in order to reach substantiated conclusions.

3. Investigation: An ability to conduct investigations of complex problems by methods that include appropriate experiments, analysis and interpretation of data, and synthesis of information in order to reach valid conclusions.

4. Design: An ability to design solutions for complex, open-ended engineering problems and to design systems, components or processes that meet specified needs with appropriate attention to health and safety risks, applicable standards, and economic, environmental, cultural and societal considerations.

5. Use of engineering tools: An ability to create, select, apply, adapt, and extend appropriate techniques, resources, and modern engineering tools to a range of engineering activities, from simple to complex, with an understanding of the associated limitations.

6. Individual and team work: An ability to work effectively as a member and leader in teams,

preferably in a multi-disciplinary setting.

7. Communication skills: An ability to communicate complex engineering concepts within the profession and with society at large. Such ability includes reading, writing, speaking and listening, and the ability to comprehend and write effective reports and design documentation, and to give and effectively respond to clear instructions.

8. Professionalism: An understanding of the roles and responsibilities of the professional engineer in society, especially the primary role of protection of the public and the public interest.

9. Impact of engineering on society and the environment: An ability to analyze social and environmental aspects of engineering activities. Such ability includes an understanding of the interactions that engineering has with the economic, social, health, safety, legal, and cultural aspects of society, the uncertainties in the prediction of such interactions; and the concepts of sustainable design and development and environmental stewardship.

10. Ethics and equity: An ability to apply professional ethics, accountability, and equity.

11. Economics and project management: An ability to appropriately incorporate economics and business practices including project, risk, and change management into the practice of engineering and to understand their limitations.

12. Life-long learning: An ability to identify and to address their own educational needs in a changing world in ways sufficient to maintain their competence and to allow them to contribute to the advancement of knowledge.

This course (ELEC 2501) will score attributes 1.4 Discipline Specific concept - Circuits, 2.2 Approach to problem, 2.3 Use of assumptions, 2.4 interpreting the solution, 7.5 Notetaking skills and listening skills. They are scored through the responses provided in assignments, quizzes, prelab and lab reports, presentations, final exams. The graduate attribute scores may in some cases be derived from graded material, however the graduate attribute scores are not used in determination of the final grade for the course.

**Use of Course Materials**: Classroom teaching and learning activities, including lectures, discussions, presentations, etc., by both instructors and students, are copy protected and remain the intellectual property of their respective author(s). All course materials, including PowerPoint presentations, outlines, and other materials, are also protected by copyright and remain the intellectual property of their respective author(s). Students registered in the course may take notes and make copies of course materials for their own educational use only. Students are not permitted to reproduce or distribute lecture notes and course materials publicly for commercial or non-commercial purposes without express written consent from the copyright holder(s).

**AI Use in this course:** Students may use AI tools for basic word processing and formatting functions, including:

- Grammar and spell checking (e.g., Grammarly, Microsoft Word Editor)
- Basic formatting and design suggestions (e.g., Microsoft Word's formatting tools,

PowerPoint Design editor)

**Documenting AI Use:** It is not necessary to document the use of AI for the permitted purposes listed above. If you have questions about a specific use of AI that isn't listed above, please consult your instructor.

**Why have we adopted this policy?** The goal of adopting a limited use of AI is to help students develop foundational skills in circuit analysis and problem solving by practicing circuit analysis without the support of AI. This policy promotes prioritization and authentic representation of work produced by students while allowing basic support to enhance clarity, correctness, layout, and flow of ideas.