

## ELEC 2501 Fall 2020 - Course Outline

### Instructors

Connor Kupchak Room: 3032 Minto Case Phone: (613) 520-2600 ext 4092 Email: connor.kupchak@carleton.ca Online Office Hours: 1 <sup>st</sup> hour after lecture alt. Tues/Thurs	John Rogers Room: 7074MC Phone: (613) 520-2600 ext 1199 Email: <a href="mailto:jrogers@doe.carleton.ca">jrogers@doe.carleton.ca</a> Office Hours:	Pavan Gunupudi Room: Phone: Email: Office Hours
--	---	---

**Textbook:** J. D. Irwin and R. M. Nelms, Basic Engineering Circuit Analysis, 11th Ed., Wiley, 2015

**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:

Labs .....20%

Quizzes.....15%

Assignment.....5%

First Mid Term.....15%

Second Mid Term .....15%

Final.....30%

- Students need to obtain a minimum of 50% in their combined term mark (labs + quizzes) 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 the course. This holds even if the lab is past due, otherwise a grade of F can be assigned.
- Students must complete at least one mid term to be eligible to pass otherwise a grade of F can be assigned. If a student is absent from one midterm the weighting will be moved to the final.

- After each midterm and the final, student's tests will be returned to them and an answer key to the test or exam will be provided. Students are encouraged to verify their test has been graded accurately.
- Grades will be assigned based on the criteria listed above ONLY and converted into a letter grade as defined in the Carleton Course Calendar.

**Internet Connections:** Since Fall 2020 will be online it is essential that students have a reliable highspeed internet connection for all their course work.

**Laboratories:**

This offering of ELEC2501 is being delivered in a completely online format and will include a laboratory component. Each student is required to independently complete and submit **an originally prepared report** for every laboratory. Submitted reports will be held to a set of standards the same as would be true for labs conducted on Carleton campus. Therefore, any documents submitted should have a high degree of quality attached to them. Lab reports should convey all data, calculations, graphs etc. with the necessary conclusions and discussions added at the end. Students can choose which software program(s) to use when preparing their reports and photos are permitted but the onus is on the student for the material to be neat and legible or 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.

**All lab reports are to be submitted as a single file in PDF format.**

You must attend your scheduled lab section as this will determine when you can remotely access the lab computers. In the event of an approved absence you may attend an alternate lab section with instructor or TA consent. Lab exemptions are not granted under any circumstances for accreditation purposes.

**PA:**

You are expected solve and understand the assigned problem sets. PA sessions will be held remotely with your assigned TA using Big Blue Button or a similar web conferencing service. Try all the problems before the PA session as you will not be able to fully digest the problems if you have not looked at them before the PA period. The intent of the problem analysis period is to help you with solving difficult problems.

When there is 50 minutes remaining in the scheduled PA session, a quiz will become available online through the links on the cuLearn page. You will have 40 minutes to complete the quiz and 10 minutes to submit documents showing your work and answers. Please familiarize yourself with the cuLearn system and manage your quiz time accordingly.

You must attend your scheduled PA section. You may attend an alternate PA section with instructor or TA consent.

### **Academic Accommodation:**

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 more details visit the Equity Services website:

<http://www.carleton.ca/equity/>

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 visit the Equity Services website:

<http://www.carleton.ca/equity/>

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](mailto: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) at <http://www.carleton.ca/pmc/new-and-current-students/dates-and-deadlines/>. You can visit the Equity Services website to view the policies and to obtain more detailed information on academic accommodation at <http://www.carleton.ca/equity/>.

### **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 specialized 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 teamwork:** 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 DOE-1, 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).