

# ELEC 3605, Electrical Engineering

**Instructors** Alan Steele, Room 4144 ME, [alan.steele@carleton.ca](mailto:alan.steele@carleton.ca)

Tony Forzley, [tony.forzley@carleton.ca](mailto:tony.forzley@carleton.ca)

**Teaching Assistants** To be announced

## Description: ELEC3605 Electrical Engineering

*DC circuits: elements, sources, analysis. Single phase AC circuits: phasors, RLC circuits, real and reactive power, impedance, network analysis, three phase systems. Power transformers. DC motors: operation and characteristics. AC motors: single phase and three phase.*

*Precludes additional credit for ELEC 2501.*

*Prerequisite(s): MATH 1005 and (PHYS 1004 or PHYS 1002), and second-year status in Engineering.*

*Lectures three hours a week, problem analysis 1.5 hours a week.*

## Regular Class Schedule

Class	1:05 pm - 2:25 pm	Tuesday & Thursday	Sep 09, 2020 - Dec 11, 2020
PA L1	4:05 pm - 5:25 pm	Thursday	Sep 09, 2020 - Dec 11, 2020
PA L2	8:35 am - 9:55 am	Monday	Sep 09, 2020 - Dec 11, 2020
PA L3	4:05 pm - 5:25 pm	Tuesday	Sep 09, 2020 - Dec 11, 2020
PA L4	1:05 pm - 2:25 pm	Monday	Sep 09, 2020 - Dec 11, 2020

## Course Website

The course will make use of cuLearn. As this will be an online offering of the course all information will be passed through cuLearn.

## Learning Objectives

This course is for BEng students who are not in an electrical engineering or related program. The course will introduce students to fundamental electrical engineering principles, circuit analysis techniques, passive electrical components (resistors, capacitors and inductors) and their response in DC and AC circuits. As well as magnetics, transformers and basic principles of motors. This knowledge will allow informed consultation with electrical engineers to resolve problems, as well as allow the student to recognize the limits of their electrical engineering competence and the need to consult.

## Learning Outcomes

At the end of the course a student should be able to:

- Demonstrate knowledge about fundamental electric parameters and laws such as current and voltage, power and Kirchhoff's voltage and current laws.
- Demonstrate knowledge and of basic electrical components such as resistors, capacitors and inductors and their characteristics.
- Read and draw basic circuit diagrams, and be able to simplifying circuits, with components in series and parallel.
- Be able to analyze and make accurate calculations of DC, transient and AC (sinusoidal) circuits involving resistors, capacitors and inductors. Analysis will be done through different methods, such as (but limited to) Nodal and Mesh analysis and Thevenin and Norton's theorem, phasors and finding equivalent circuits.
- Demonstrate how a three-phase AC system works.
- Explain how DC can be produced from an AC signal.
- Demonstrate knowledge of magnetic circuits and magnetic parameters.
- Demonstrate how a transformer works and make related calculations.
- Explain the principles of AC and DC motors and make basic calculations
- Explain basic safety relating to electricity and electrical systems

## Course Content

1. Fundamental physical considerations
2. Fundamentals of circuit theory
3. Resistive circuits
4. Inductance and Capacitance
5. Transients
6. Steady State Sinusoidal Analysis
7. Magnetic circuits and transformers
8. DC Machines (Motors)
9. AC Machines (Motors)
10. Electrical safety

## Teaching Modality

This course will be delivered online through cuLearn in fall term 2020, as all others classes will be, due to the COVID-19 pandemic. Because of the size of the class the course will be delivered in a blended form, with selected reading from the main course text, videos and audio recordings to provide additional material and guidance. During the scheduled class time the course instructor will be available (through Big Blue Button or similar) to help with questions and help clarify. Problem analysis sessions with TAs will be at the scheduled time and that will give an opportunity for students to work on problems set. TAs can help with clarifying any issues with the questions or with course material.

The course cuLearn website should be checked regularly as this will be the main route for information. Resources will be posted there as will be assessments and your individual access to the site monitored to ensure you are progressing.

Instructors and TAs can be contacted by email. We ask that when sending emails the course code 'ELEC3605' be included in the subject line.

Printed resources are listed below and include a course text bought which is *required* to be purchased. This is available as a printed book, eText book, or a custom eText specifically for the course. A course pack will be available (chapters will likely be released regularly, rather than a full pack) and two open text books (free) have been located that provide a supplemental resource whilst studying the material, although they do not cover all material.

Because of the online nature of the course, we recommend students engage with the recommended texts, the course website and its resources. The instructors and TAs will be available to help you with help and guidance. It is expected you will check the cuLearn website at least once a week (probably more often would be better) and please pay attention to any emails that are sent to you from the course instructors or TAs.

Because of the risk of scheduling conflicts, there is no formally scheduled office hours. Please email your instructor or TA for a mutually convenient time to meet if you have questions.

## Text Book and Other Resources

❖ The main course text is:

- ▶ *Electrical Engineering: Principles and Applications*, Allan R. Hambley, 7th Ed., Pearson (2018)

This is available through the Carleton Bookstore, including for rental and eText. A link will be provided in cuLearn. A custom eText is also available (to offer a lowest cost option) and again a link is provided in cuLearn. Problems will be assigned from the text so it is required.

- ❖ A course pack, *ELEC3605, Electrical Engineering*, by Carl Kropp, Fall 2015 (edited by Prof. Calvin Plett and Prof. Steele) will be provided on cuLearn (in chapters).
- ❖ There are some open text books that will have relevant information and could be very helpful. These will be useful secondary resources.
  - ▶ *DC Electrical Circuit Analysis: A Practical Approach*, James M. Fiore, Version 1.0.3, 08 June 2020, ISBN13: 978-1654515478,
  - ▶ *AC Electrical Circuit Analysis: A Practical Approach*, James M. Fiore, Version 1.0.1, 22 April 2020, ISBN13: 979-8605022282

See <http://www.dissidents.com/books.htm>

**Important Note:** *Student or professor material created for this course (including presentations, videos, posted notes, labs, case studies, worksheets, assignments and exams) remain the intellectual property of the author/creator. They are intended for personal use and may not be reproduced or redistributed without prior written consent of the author(s)/creator(s). Materials created under a Creative Commons license or similar should have the respective license adhered to.*

### Assessment Scheme

Tests	40%	Regularly set across the term
Assignments	30%	Two will be assigned
Final Examination	30%	

There must be attempts at each type of assessment, unless there are extenuating reasons, for example health reasons. There will be 8 tests at regular points along the course and the average mark from the best 7 will be taken towards the final grade.

All tests and the examination are open book and this means only the recommended texts (Hambley and Fiore), the course pack and your notes can be used during those assessments. Any communication, including electronic communication, with others during a test or examination is expressly not permitted.

A scientific calculator will be needed and is allowed in tests and exams.

### Academic Integrity

As with other courses it is assumed that work done by you for the course will be done with academic integrity. As potential future engineers it is expected that you will pursue your profession with integrity. The Universities academic integrity policy webpage can be found at <https://carleton.ca/registrar/academic-integrity/>

## Key Term Dates

Selected dates from <https://carleton.ca/registrar/registration/dates-and-deadlines/> provided here for your convenience. Please check the link above incase there are any changes.

09 Sept. 2020	Term Start.
23 Sept. 2020	Last day of registration for fall term and fall/winter courses.
30 Sept. 2020	Last day to withdraw from fall term and fall/winter courses with a full <b>fee adjustment</b> (financial withdrawal).
12 Oct. 2020	Statutory holiday. University closed.
26-30 Oct. 2020	Fall break. Classes suspended.
13 Nov. 2020	Last day to request formal exam accommodations for December examinations to the Paul Menton Centre for Students with Disabilities.
27 Nov. 2020	Last day for summative tests or examinations or formative tests or examinations totaling more than 15% of the final grade before the official examination period.
11 Dec. 2020	Fall term ends. Last day of fall term classes. Classes follow a Monday schedule. Last day for academic withdrawal from fall term courses. Last day for handing in term work and the last day that can be specified by a course instructor as a due date for term work for fall term courses.

## Academic Accommodation

Details on academic accommodation, for a range of reasons, can be found at <https://students.carleton.ca/course-outline/>

## 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 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 3605) will score attribute 1 a *knowledge base for engineering*. They are scored through the responses provided in assignments, quizzes, pre-lab 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.