ELEC 3605, Electrical Engineering

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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		Tues & Thurs		Jan 9, 2023 - Apr 12, 2023
PA1		Friday		Jan 9, 2023 - Apr 12, 2023
PA2		Thursday		Jan 9, 2023 - Apr 12, 2023
PA3		Wednesday		Jan 9, 2023 - Apr 12, 2023
PA4		Monday		Jan 9, 2023 - Apr 12, 2023
PA5		Tuesday		Jan 9, 2023 - Apr 12, 2023
PA6		Monday		Jan 9, 203

Check Carleton Central for any changes.

Course Website
The course will make use of BrightSpace.

Learning Objectives

This course is for BEng students who are not in an electrical engineering or closely 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 in person, both for the class sessions and for the problem analysis session.

The course BrightSpace website should be checked regularly as this will be a key route for information. Resources will be posted there.

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 book which is *required* to be purchased. This is available as a printed book or an eText. A course pack notes will be available, being released at regular intervals on Brightspace 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.

The instructors and TAs will be available to provide you with help and guidance. It is expected you will check the course Brightspace area 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.

Office hours

The instructor, Prof Steele, will have office hours on:

Tuesday 10-11am and Thursday 1:30 - 2:30pm.

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 as an eText through the Carleton Bookstore as well as from Pearson direct. Links will be provided in BrightSpace. 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 Brightspace (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

Assessment Scheme

Tests	30%	Three set across the term
Assignments	20%	Two will be assigned
Final Examination	50%	

There must be attempts at each type of assessment, unless there are extenuating reasons, for example health reasons.

All tests and the examination are in-person.

Late assignment submissions will usually incur a penalty.

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

9 Jan. 2023	Winter term begin.
20 Jan. 2023	Last day for registration and course changes (including auditing) in full winter and late winter courses.
31 Jan. 2023	Last day to withdraw from full winter and the winter portion of fall/winter courses with a full fee adjustment. Withdrawals after this date will result in a permanent notation of WDN on the official transcript.
20 Feb. 2023	Statutory holiday. University closed.
20-24 Feb. 2023	Winter break, no classes.
15 Mar. 2023	Last day for academic withdrawal from full winter, late winter, and fall/winter courses. Last day to request Formal Examination Accommodation Forms for April full winter, late winter, and fall/winter final examinations to the Paul Menton Centre for Students with Disabilities. Note that it may not be possible to fulfil accommodation requests received after the specified deadlines.
29 Mar. 2023	Last day for summative tests or examinations, or formative tests or examinations totaling more than 15% of the final grade, in full winter term or fall/winter undergraduate courses, before the official April final examination period (see examination regulations in the Academic Regulations of the University section of the Undergraduate Calendar/General Regulations of the Graduate Calendar).
7 Apr. 2023	Statutory holiday. University closed.

12 Apr. 2023	Winter term ends. Last day of full winter, late winter, and fall/winter classes. Classes follow a Friday schedule. Last day for final take-home examinations to be assigned, with the exception of those conforming to the examination regulations in the Academic Regulations of the University section of the Undergraduate Calendar/General Regulations of the Graduate Calendar. Last day that can be specified by a course instructor as a due date for term work for full winter and late winter courses.
13-14 Apr. 2023	No classes or examinations take place.
15-27 Apr. 2022	Final examinations in full winter, late winter, and fall/winter courses will be held. Examinations are normally held all seven days of the week.

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 managementinto the practice of engineering and to understand their limitations.

12.*Life-long learning*: An ability to identify and to address their own educational needsin 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.

Email Details

We recommend you add ELEC3605 to the subject line.

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