ELEC ENG 2CI5
Introduction to Electrical Engineering
Fall 2017
Course Outline

CALENDAR/COURSE DESCRIPTION

Current, potential difference; Kirchhoff’s laws; Ohm’s Law; circuit elements; mesh/nodal analysis of electrical circuits; first and second order circuits; complex arithmetic; phasors, impedance and admittance; AC power.

PRE-REQUISITES AND ANTI-REQUISITES

Prerequisite(s): Registration in a Computer Engineering or Electrical Engineering program
Antirequisite(s): ELEC ENG 2CI4

SCHEDULE

C01
Lectures: Tuesdays, Thursdays, and Fridays 11:30 a.m.  KTH-B135
Tutorials: Tuesdays 8:30 a.m.  BSB-135

C02
Lectures: Tuesdays, Thursdays, and Fridays 11:30 a.m.  JHE-376
Tutorials: Mondays 8:30 a.m.  KTH-B135

Laboratories:
L01 Mondays 2:30 - 5:30 p.m.
L02 Tuesdays 2:30 - 5:30 p.m.
L03 Wednesdays 2:30 - 5:30 p.m.
L04 Thursdays 2:30 - 5:30 p.m.
L05 Fridays 2:30 - 5:30 p.m.
L06 Wednesdays 5:30 - 8:30 p.m.
L07 Mondays 5:30 – 8:30 p.m.
L08 Tuesdays 5:30 – 8:30 p.m.

INSTRUCTORS’ OFFICE HOURS AND CONTACT INFORMATION

C01
Dr. Mohamed Bakr
ITB-A219
mbakr@mcmaster.ca
Ext. 24079

Office Hours:
Mondays, Thursdays – 2:30 - 3:30 p.m.

C02
Dr. Peter Smith
ITB-A218
smithpm@mcmaster.ca
Ext. 27080

Office Hours:
Tuesdays, Thursdays – 2:30 - 3:30 p.m.
**Teaching Assistant Office Hours and Contact Information**

**C01**

<table>
<thead>
<tr>
<th>Ahmed Elsharabasy</th>
<th>Mahmoud Maghrabi</th>
<th>Ehab Sayed</th>
<th>Ayman Negm</th>
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<tbody>
<tr>
<td>ITB-A201</td>
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<tr>
<td><a href="mailto:elsharay@mcmaster.ca">elsharay@mcmaster.ca</a></td>
<td><a href="mailto:maghrabm@mcmaster.ca">maghrabm@mcmaster.ca</a></td>
<td><a href="mailto:sayede1@mcmaster.ca">sayede1@mcmaster.ca</a></td>
<td><a href="mailto:negma1@mcmaster.ca">negma1@mcmaster.ca</a></td>
</tr>
<tr>
<td>Ext. 24971</td>
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<thead>
<tr>
<th>Farzad Foroutan</th>
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<tbody>
<tr>
<td>ITB-A201</td>
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<td><a href="mailto:foroutf@mcmaster.ca">foroutf@mcmaster.ca</a></td>
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<td>Ext. 24971</td>
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**C02**

<table>
<thead>
<tr>
<th>Yu Miao</th>
<th>Yang Yu</th>
<th>Alan Dornelles Callegaro</th>
<th>Kafi Mehrshad</th>
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<tbody>
<tr>
<td><a href="mailto:miaoy3@mcmaster.ca">miaoy3@mcmaster.ca</a></td>
<td><a href="mailto:yuy81@mcmaster.ca">yuy81@mcmaster.ca</a></td>
<td><a href="mailto:dornelea@mcmaster.ca">dornelea@mcmaster.ca</a></td>
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<tr>
<td>Yameng Chang</td>
<td></td>
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<tr>
<td><a href="mailto:changy29@mcmaster.ca">changy29@mcmaster.ca</a></td>
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**Course Website/Alternate Methods of Communication**

Course materials will be posted on Avenue to Learn (http://avenue.mcmaster.ca/).

**Course Objectives**

By the end of this course, students should be able to:

- Analyze circuit systems using nodal analysis and/or mesh analysis.
- Be able to interpret analytical results and assign properly powers, currents and voltages to circuit elements.
- Explain the characteristics of resistors, capacitors and inductors.
- Compute time response of first-order RC and RL circuits.
- Analyze RLC circuits using phasor techniques and interpret analytical results and assign properly powers, currents and voltages to circuit elements.
• Work in a group in an effective and efficient manner in order to achieve goals of assigned laboratory work.
• Clearly communicate engineering design work in both written and oral formats.
• Understand sustainability aspect and its relation to power engineering systems.

ASSUMED KNOWLEDGE

Linear algebra, basic complex algebra, first-order differential equations.

COURSE MATERIALS

Required Texts:

Calculator:
Only the McMaster Standard Calculator will be permitted in tests and examinations.

COURSE OVERVIEW

<table>
<thead>
<tr>
<th>Weeks</th>
<th>Topics</th>
<th>Textbook</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Charge, current and voltage. Voltage and current sources.</td>
<td>Chapter 1</td>
</tr>
<tr>
<td>2-3</td>
<td>Resistive circuits, Ohm's law, parallel and series circuits, voltage and current dividers, wye and delta circuits.</td>
<td>Chapter 2</td>
</tr>
<tr>
<td>4-5</td>
<td>Nodal and loop analysis techniques, Kirchhoff's laws.</td>
<td>Chapter 3</td>
</tr>
<tr>
<td>6-7</td>
<td>Superposition techniques in linear circuits. Thevenin and Norton equivalent circuits. Power transfer.</td>
<td>Chapter 5</td>
</tr>
<tr>
<td>8-9</td>
<td>Capacitance and inductance, energy storage, integrator and differentiator circuits</td>
<td>Chapter 6</td>
</tr>
<tr>
<td>10</td>
<td>Transient circuit analysis</td>
<td>Chapter 7</td>
</tr>
<tr>
<td>11-12</td>
<td>AC steady-state analysis, phasors, power relationships.</td>
<td>Chapter 8</td>
</tr>
</tbody>
</table>

LABORATORY OVERVIEW

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Laboratory safety</td>
</tr>
<tr>
<td>5</td>
<td>Introduction to instrumentation</td>
</tr>
<tr>
<td>6</td>
<td>Resistive circuits</td>
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<tr>
<td>7</td>
<td>Thevenin equivalent circuits</td>
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<tr>
<td>8</td>
<td>RC circuits</td>
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<td>9</td>
<td>RL circuits</td>
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<tr>
<td>10</td>
<td>Introduction to PSpice</td>
</tr>
<tr>
<td>11</td>
<td>RLC resonant circuits in PSpice</td>
</tr>
<tr>
<td>12</td>
<td>Make-up lab (requires permission from instructor)</td>
</tr>
</tbody>
</table>
LABORATORY OPERATION

The laboratory for this course is in ITB-A114. Students will be granted permission to enter room via access cards. No food or drink permitted in the lab. Please keep the lab clean. Soldering is not permitted in ITB-A114.

ASSESSMENT

<table>
<thead>
<tr>
<th>Component</th>
<th>Weight</th>
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<tbody>
<tr>
<td>Laboratories</td>
<td>20%</td>
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<tr>
<td>Tests (October 6th and November 10th)</td>
<td>30%</td>
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<tr>
<td>Quizzes</td>
<td>10%</td>
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<tr>
<td>Final Examination</td>
<td>40%</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>100%</strong></td>
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Students are expected to attend all lectures and tutorials, as well as their assigned laboratory section. Students will be responsible for all material covered in these venues.

ACCREDITATION LEARNING OUTCOMES

Note: The Learning Outcomes defined in this section are measured throughout the course and form part of the Department’s continuous improvement process. They are a key component of the accreditation process for the program and will not be taken into consideration in determining a student’s actual grade in the course. For more information on accreditation, please ask your instructor or visit: [http://www.engineerscanada.ca](http://www.engineerscanada.ca).

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>Indicators</th>
<th>Measurement Methods(s)</th>
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</thead>
<tbody>
<tr>
<td>Use mathematics, circuit laws and network theorems to analyze and solve problems in simple and complex D.C. circuits.</td>
<td>1.1, 2.2</td>
<td>Exams</td>
</tr>
<tr>
<td>Describe the principles of inductance and capacitance and explain their effects on circuit performance.</td>
<td></td>
<td>Exams</td>
</tr>
<tr>
<td>Solve problems in determining charge magnitude, timing and transient response in both inductive and capacitive circuits.</td>
<td>3.1</td>
<td>Exams</td>
</tr>
<tr>
<td>Safely use test equipment commonly found in industry for the measurement of electrical circuit parameters.</td>
<td>11.2</td>
<td>Labs</td>
</tr>
<tr>
<td>Use theoretical basis to propose simple circuit design and test the performance in the laboratory setting</td>
<td>7.3, 9.3</td>
<td>Labs</td>
</tr>
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</table>
ACADEMIC INTEGRITY

You are expected to exhibit honesty and use ethical behaviour in all aspects of the learning process. Academic credentials you earn are rooted in principles of honesty and academic integrity.

 Academic dishonesty is to knowingly act or fail to act in a way that results or could result in unearned academic credit or advantage. This behaviour can result in serious consequences, e.g. the grade of zero on an assignment, loss of credit with a notation on the transcript (notation reads: “Grade of F assigned for academic dishonesty”), and/or suspension or expulsion from the university.

It is your responsibility to understand what constitutes academic dishonesty. For information on the various types of academic dishonesty please refer to the Academic Integrity Policy, located at http://www.mcmaster.ca/academicintegrity

The following illustrates only three forms of academic dishonesty:

1. Plagiarism, e.g. the submission of work that is not one’s own or for which other credit has been obtained.
2. Improper collaboration in group work.
3. Copying or using unauthorized aids in tests and examinations.

ACADEMIC ACCOMMODATIONS

Students who require academic accommodation must contact Student Accessibility Services (SAS) to make arrangements with a Program Coordinator. Academic accommodations must be arranged for each term of study. Student Accessibility Services can be contacted by phone at 905.525.9140 ext. 28652 or e-mail at sas@mcmaster.ca. For further information, consult McMaster University’s Policy for Academic Accommodation of Students with Disabilities.

NOTIFICATION OF STUDENT ABSENCE AND SUBMISSION OF REQUEST FOR RELIEF FOR MISSED ACADEMIC WORK

In the event of an absence for medical or other reasons, students should review and follow the Academic Regulation in the Undergraduate Calendar “Requests for Relief for Missed Academic Term Work”. Please note these regulations changed beginning in Fall 2015.

NOTICE REGARDING POSSIBLE COURSE MODIFICATION
The instructor and university reserve the right to modify elements of the course during the term. The university may change the dates and deadlines for any or all courses in extreme circumstances. If either type of modification becomes necessary, reasonable notice and communication with the students will be given with explanation and the opportunity to comment on changes. It is the responsibility of the student to check their McMaster email and course websites weekly during the term and to note any changes.
Information for Laboratory Safety and Important Contacts

This document is for users of ECE instructional laboratories in the Information Technology Building.

This document provides important information for the healthy and safe operation of ECE instructional laboratories. This document is required reading for all laboratory supervisors, instructors, researchers, staff, and students working in or managing instructional laboratories in ECE. It is expected that revisions and updates to this document will be done continually. A McMaster University lab manual is also available to read in every laboratory.

General Health and Safety Principles

Good laboratory practice requires that every laboratory worker and supervisor observe the following:

1. Food and beverages are not permitted in the instructional laboratories.
2. A Laboratory Information Sheet on each lab door identifying potential hazards and emergency contact names should be known.
3. Laboratory equipment should only be used for its designed purpose.
4. Proper and safe use of lab equipment should be known before using it.
5. The course TA leading the lab should be informed of any unsafe condition.
6. The location and correct use of all available safety equipment should be known.
7. Potential hazards and appropriate safety precautions should be determined, and sufficiency of existing safety equipment should be confirmed before beginning new operations.
8. Proper waste disposal procedures should be followed.

Location of Safety Equipment

**Fire Extinguisher**
On walls in halls outside of labs

**First Aid Kit**
ITB A111, or dial “88” after 4:30 p.m.

**Telephone**
On the wall of every lab near the door

**Fire Alarm Pulls**
Near all building exit doors on all floors
In Case of a Fire (Dial 88)
When calling to report a fire, give name, exact location, and building.

1. Immediately vacate the building via the nearest Exit Route. Do not use elevators!
2. Everyone is responsible for knowing the location of the nearest fire extinguisher, the fire alarm, and the nearest fire escape.
3. The safety of all people in the vicinity of a fire is of foremost importance. But do not endanger yourself!
4. In the event of a fire in your work area shout “Fire!” and pull the nearest fire alarm.
5. Do not attempt to extinguish a fire unless you are confident it can be done in a prompt and safe manner utilizing a hand-held fire extinguisher. Use the appropriate fire extinguisher for the specific type of fire. Most labs are equipped with Class A, B, and C extinguishers. Do not attempt to extinguish Class D fires that involve combustible metals such as magnesium, titanium, sodium, potassium, zirconium, lithium, and any other finely divided metals that are oxidizable. Use a fire sand bucket for Class D fires.
6. Do not attempt to fight a major fire on your own.
7. If possible, make sure the room is evacuated; close but do not lock the door and safely exit the building.

Clothing on Fire
Do not use a fire extinguisher on people

1. Douse with water from safety shower immediately or
2. Roll on floor and scream for help or
3. Wrap with fire blanket to smother flame (a coat or other nonflammable fiber may be used if blanket is unavailable). Do not wrap a standing person; rather, lay the victim down to extinguish the fire. The blanket should be removed once the fire is out to disperse the heat.
Equipment Failure or Hazard
Failure of equipment may be indicative of a safety hazard - You must report all incidents.
Should you observe excessive heat, excessive noise, damage, and/or abnormal behaviour of the lab equipment:
1. Immediately discontinue use of the equipment.
2. In Power Lab, press wall-mounted emergency shut-off button.
3. Inform your TA of the problem.
4. Wait for further instructions from your TA.
5. TA must file an incident report.

Protocol for Safe Laboratory Practice
Leave equipment in a safe state for the next person - if you’re not sure, ask!
In general, leave equipment in a safe state when you finish with it. When in doubt, consult the course TA.

Defined Roles

<table>
<thead>
<tr>
<th>Role</th>
<th>Contact Information</th>
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</thead>
<tbody>
<tr>
<td>TA</td>
<td>The first point of contact for lab supervision</td>
</tr>
<tr>
<td>ECE Lab Supervisor</td>
<td>Steve Spencer - ITB 147 - <a href="mailto:steve@mail.ece.mcmaster.ca">steve@mail.ece.mcmaster.ca</a></td>
</tr>
<tr>
<td>ECE Chair</td>
<td>Tim Davidson - ITB A111 - <a href="mailto:davidson@mcmaster.ca">davidson@mcmaster.ca</a></td>
</tr>
<tr>
<td>ECE Administrator</td>
<td>Kerri Hastings - ITB A111 - <a href="mailto:hastings@mcmaster.ca">hastings@mcmaster.ca</a></td>
</tr>
<tr>
<td>ECE Course Instructor</td>
<td>Peter Smith - ITB A218 - <a href="mailto:smithpm@mcmaster.ca">smithpm@mcmaster.ca</a></td>
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</table>