# Course Outline

## 1. COURSE INFORMATION

<table>
<thead>
<tr>
<th>Session Offered</th>
<th>Fall 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Name</td>
<td>Electricity &amp; Electronics 2</td>
</tr>
<tr>
<td>Course Code</td>
<td>Proc Tech 2EE3</td>
</tr>
<tr>
<td>Date(s) and Time(s) of lectures</td>
<td>Tue, Thu 4:30 – 6:20</td>
</tr>
<tr>
<td>Program Name</td>
<td>Process Automation Technology</td>
</tr>
<tr>
<td>Calendar Description</td>
<td>This second course in electricity and electronic science will be presented through lectures and labs. The course content covers: filters and frequency response, ideal transformers, AC circuit analysis, transistor circuitry, and amplifiers.</td>
</tr>
</tbody>
</table>

### Instructor(s)

- **Lectures:** Yaser M. Haddara  
  yaser@mcmaster.ca  
  Office Hours & Location: ITB-A223  
  By appointment
- **Labs:** Mehdi Alimardani  
  alimarm@mcmaster.ca  
  Hassanain Awadh  
  hawadh@mcmaster.ca

## 2. COURSE SPECIFICS

### Course Description

### Instruction Type

<table>
<thead>
<tr>
<th>Code</th>
<th>Type</th>
<th>Hours per term</th>
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</thead>
<tbody>
<tr>
<td>C</td>
<td>Classroom instruction</td>
<td>50</td>
</tr>
<tr>
<td>L</td>
<td>Laboratory, workshop or fieldwork</td>
<td>36</td>
</tr>
<tr>
<td>T</td>
<td>Tutorial</td>
<td></td>
</tr>
<tr>
<td>DE</td>
<td>Distance education</td>
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</table>

**Total Hours:** 86

### Resources

<table>
<thead>
<tr>
<th>ISBN</th>
<th>Textbook Title &amp; Edition</th>
<th>Author &amp; Publisher</th>
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</table>
Oxford University Press. |
| 2. 978-0-19-543036-3 | Accompanying Lab Manual                   |                                    |

### Other Supplies

<table>
<thead>
<tr>
<th>Source</th>
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<tbody>
<tr>
<td>Lab kit</td>
<td>Campus Store</td>
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### Prerequisite(s)

Eng Tech 1EL3, 1MC3

### Corequisite(s)

None

### Antirequisite(s)

None
Course Specific Policies

• Only McMaster standard scientific calculators (check the registrar’s policy) are allowed in exams
• Exams are comprehensive
• All tests are closed book with a formula sheet provided by the instructor
• The instructor reserves the right to choose the format of any deferred midterms or final exams (format may be written or oral)
• Communication from the instructor to all students will be either posted on Avenue as an update or emailed from Mosaic to the class list; students need to update their email address on Mosaic and to check emails regularly. In particular, this will be the way that I will communicate any emergency class cancelation or reschedule.
• Communication to the instructor must be directed to the yaser@mcmaster.ca email address and must contain the tag [2EE3] in the subject line. Emails sent to my Avenue inbox or not containing the appropriate tag in the subject line may be ignored.

Departmental Policies

Students must maintain a GPA of 3.5/12 to continue in the program.

In order to achieve the required learning objectives, on average, B.Tech. students can expect to do at least 3 hours of “out-of-class” work for every scheduled hour in class. “Out-of-class” work includes reading, research, assignments and preparation for tests and examinations.

Where group work is indicated in the course outline, such collaborative work is mandatory.

The use of cell phones, iPods, laptops and other personal electronic devices are prohibited from the classroom during the class time, unless the instructor makes an explicit exception.

Announcements made in class or placed on Avenue are considered to have been communicated to all students including those individuals that are not in class.

Instructor has the right to submit work to software to identify plagiarism.

3. SUB TOPIC(S)

<table>
<thead>
<tr>
<th>Week 1</th>
<th>Sep. 5-7</th>
<th>CHAPTERS 17-22</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>REVIEW of AC Circuit Analysis</td>
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<table>
<thead>
<tr>
<th>Week 2</th>
<th>Sep. 12-14</th>
<th>CHAPTER 24</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>FILTERS AND THE BODE PLOT</td>
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<tr>
<td></td>
<td></td>
<td>24.1 Basic Filter Types</td>
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<tr>
<td></td>
<td></td>
<td>24.2 Power Measurement in Decibels</td>
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<td></td>
<td></td>
<td>24.3 RC Low-Pass Filters</td>
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<table>
<thead>
<tr>
<th>Week 3</th>
<th>Sep. 19-21</th>
<th>24.4 RC High-Pass Filters</th>
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<tbody>
<tr>
<td></td>
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<td>24.5 Filter Frequency Response Graphs</td>
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<tr>
<td></td>
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<td>24.6 RL Low-Pass and High-Pass Filters</td>
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<tr>
<td></td>
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<td>24.7 Bandpass Filters</td>
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<td>24.8 Notch Filters</td>
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<tr>
<th>Week 4</th>
<th>Sep. 26-28</th>
<th>CHAPTER 25</th>
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<tr>
<td></td>
<td></td>
<td>TRANSFORMERS AND COUPLED CIRCUITS</td>
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<tr>
<td></td>
<td></td>
<td>25.1 Principle of Transformer Operation</td>
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<tr>
<td></td>
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<td>25.2 EMF Equation</td>
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<td></td>
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<td>25.3 Transformer on No-Load</td>
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<tr>
<td></td>
<td></td>
<td>25.4 Transformer on Load</td>
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<tr>
<td></td>
<td></td>
<td>25.5 Referred Resistance and Reactance</td>
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<tr>
<td>Week 5</td>
<td>Oct. 3-5</td>
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<tr>
<td><strong>CHAPTER 1</strong>&lt;br&gt;BASIC SEMICONDUCTOR AND PN-JUNCTION THEORY&lt;br&gt;1.1 Atomic Theory&lt;br&gt;1.2 Conduction in Solids&lt;br&gt;1.3 Conductors, Semiconductors, and Insulators&lt;br&gt;1.4 n-Type and p-Type Semiconductors&lt;br&gt;1.5 The pn-Junction&lt;br&gt;1.6 Biased Junctions</td>
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<tr>
<td><strong>Mid-term recess (Monday, October 9 to Sunday, October 15)</strong></td>
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<thead>
<tr>
<th>Week 6</th>
<th>Oct. 17-19</th>
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<tr>
<td><strong>CHAPTER 14</strong>&lt;br&gt;IC OPERATIONAL AMPLIFIERS AND BASIC OP-AMP CIRCUITS&lt;br&gt;14.1 Integrated Circuit Operational Amplifiers&lt;br&gt;14.2 Biasing Operational Amplifiers&lt;br&gt;14.3 Voltage Follower Circuits&lt;br&gt;14.4 Non-Inverting Amplifiers&lt;br&gt;14.5 Inverting Amplifiers</td>
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<thead>
<tr>
<th>Week 7</th>
<th>Oct. 24-26</th>
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<tbody>
<tr>
<td><strong>CHAPTER 2</strong>&lt;br&gt;SEMICONDUCTOR DIODES&lt;br&gt;2.1 pn-Junction Diodes&lt;br&gt;2.2 Characteristics and Parameters&lt;br&gt;2.3 Diode Approximations&lt;br&gt;2.4 DC Load Line Analysis&lt;br&gt;2.9 Zener Diodes</td>
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<thead>
<tr>
<th>Week 8</th>
<th>Oct. 31 – Nov. 2</th>
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</thead>
<tbody>
<tr>
<td><strong>CHAPTER 3</strong>&lt;br&gt;DIODE APPLICATIONS&lt;br&gt;3.1 Half-Wave Rectification&lt;br&gt;3.2 Full-Wave Rectification&lt;br&gt;3.4 Full-Wave Rectifier Power Supply&lt;br&gt;3.6 Power Supply Performance and Testing&lt;br&gt;3.7 Zener Diode Voltage Regulators</td>
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<table>
<thead>
<tr>
<th>Week 9</th>
<th>Nov. 7-9</th>
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</thead>
<tbody>
<tr>
<td><strong>CHAPTER 4</strong>&lt;br&gt;BIPOLAR JUNCTION TRANSISTORS (BJTs)&lt;br&gt;4.1 BJT Operation&lt;br&gt;4.2 BJT Voltages and Currents&lt;br&gt;4.3 BJT Amplification&lt;br&gt;4.4 BJT Switching&lt;br&gt;4.6 Common-Emitter Characteristics</td>
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</tr>
</tbody>
</table>

| **CHAPTER 5**<br>BJT BIASING<br>5.1 DC Load Line and Bias Point<br>5.2 Base Bias<br>5.4 Voltage-Divider Bias<br>5.5 Comparison of Basic Bias Circuits<br>5.6 Troubleshooting BJT Bias Circuits<br>5.7 Bias Circuit Design |

| **CHAPTER 6**<br>AC ANALYSIS OF BJT CIRCUITS<br>6.1 Coupling and Bypassing Capacitors<br>6.3 Transistor Models and Parameters<br>6.4 Common-Emitter Circuit Analysis |
6.6 Common-Collector Circuit Analysis
6.8 Comparison of CE, CC, and CB Circuits

Week 10
Nov. 14-16

CHAPTER 9
FIELD EFFECT TRANSISTORS
9.1 Junction Field Effect Transistors
9.2 JFET Characteristics
9.3 JFET Data Sheets and Characteristics
9.4 JFET Amplification and Switching 9.5 MOSFETs

CHAPTER 10
FET BIASING
10.1 DC Load Line and Bias Point
10.4 Voltage-Divider Bias
10.10 MOSFET Biasing

TERM TEST 2

Week 11
Nov. 21-23

CHAPTER 11
AC ANALYSIS OF FET CIRCUITS
11.2 FET Models and Parameters
11.3 Common-Source Circuit Analysis
11.7 Comparison of FET and BJT Circuits

Week 12
Nov. 28-30

REVIEW

Week 13
Dec. 5

REVIEW

Classes end – Wednesday December 6, 2017
Final examination period: Wednesday December 8, 2017 to Thursday, December 21, 2017
All examinations MUST BE written during the scheduled examination period.

List of experiments

Lab 1
#15: Oscilloscope (Review)
#17: AC RC circuit (Review)

Lab 2
#21: Series Resonance
#22: parallel Resonance

Lab 3
#23: Low Pass and High Pass Filter

Lab 4
Band Pass Filter (Instructions will be provided)

Lab 5
Single Phase Transformer (Instructions will be provided)

Mid-term recess (Monday, October 9 to Sunday, October 15)

Lab 6
Lab Test #1

Lab 7
#25: Op-Amp Biasing and Parameters (Instructions will be provided)
#26: Op-Amp Voltage followers and Non-Inverting Amplifiers (Instructions will be provided)

Lab 8
Active filters (Instructions will be provided)
Lab 9
Diode Characteristics (Instructions will be provided)
Diode Rectifier Circuits (Instructions will be provided)
Rectifier DC Power Supplies (Instructions will be provided)

Lab 10
BJTs (Instructions will be provided)

Lab 11
BJT Amplifiers (Instructions will be provided)

Lab 12
Lab Test #2

Week 13
Make-up labs

Note that this structure represents a plan and is subject to adjustment term by term.
The instructor and the 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.

4. ASSESSMENT OF LEARNING *including dates*

<table>
<thead>
<tr>
<th>Activity</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weekly quiz</td>
<td>100</td>
</tr>
<tr>
<td>Class participation</td>
<td>100</td>
</tr>
<tr>
<td>Review Test (Tuesday Sept. 19)</td>
<td>100</td>
</tr>
<tr>
<td>2 Term Tests</td>
<td>200</td>
</tr>
<tr>
<td>Final Exam</td>
<td>200</td>
</tr>
<tr>
<td>Lab Reports</td>
<td>200</td>
</tr>
<tr>
<td>2 Lab Tests</td>
<td>200</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>1100</strong></td>
</tr>
</tbody>
</table>

The course is graded on a basis of 1100 points. A percentage mark is calculated by dividing the total by 10, with a maximum of 100%. This builds in flexibility for the student to manage his/her learning by prioritizing activities that result in better mastery of the material.
Percentage grades will be converted to letter grades and grade points per the University calendar.

5. LEARNING OUTCOMES

1. Classify filter circuits according to their frequency response
2. Explain operation of transformer circuits and their performance parameters
3. Explain principles of operation of semiconductor devices
4. Compare characteristics and specifications of diodes, transistors, and amplifiers
5. Design filter circuits, transformer circuits, power supply regulation circuits, and transistor amplifier circuits to meet specifications and design constraints
6. Check the performance of microelectronic circuits against real world application requirements

6. POLICIES

Anti-Discrimination
The Faculty of Engineering is concerned with ensuring an environment that is free of all discrimination. If there is a problem, individuals are reminded that they should contact the Department Chair, the Sexual Harassment Officer or the Human Rights Consultant, as soon as possible.

Academic Integrity
You are required to exhibit honestly 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 kinds of academic dishonesty please refer to the Academic Integrity Policy, located at: [http://www.mcmaster.ca/policy/Students-AcademicStudies/AcademicIntegrity.pdf](http://www.mcmaster.ca/policy/Students-AcademicStudies/AcademicIntegrity.pdf).

The following illustrates only three forms of academic dishonesty:
1. Plagiarism. E.g. the submission of work that is not 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.

### Requests for Relief for Missed Academic Term Work (Assignments, Mid-Terms, etc.)

The McMaster Student Absence Form is a self-reporting tool for Undergraduate Students to report absences that last up to 3 days and provides the ability to request accommodation for any missed academic work. Please note, this tool cannot be used during any final examination period.

You may submit a maximum of 1 Academic Work Missed requests per term. It is YOUR responsibility to follow up with your Instructor immediately regarding the nature of the accommodation.

If you are absent more than 3 days or exceed 1 request per term you MUST visit your Associate Dean's Office (Faculty Office). You may be required to provide supporting documentation.

This form should be filled out immediately when you are about to return to class after your absence. [http://www.mcmaster.ca/msaf/](http://www.mcmaster.ca/msaf/)

### E-Learning Policy

Consistent with the Bachelor of Technology’s policy to utilize e-learning as a complement to traditional classroom instruction, students are expected to obtain appropriate passwords and accounts to access Avenue To Learn for this course. Materials will be posted by class for student download. It is expected that students will avail themselves of these materials prior to class. Students should be aware that, when they access the electronic components of this course, private information such as first and last names, user names for the McMaster e-mail account, and program affiliation may become apparent to all other students in the course. The available information is dependent on the technology used. Continuation in this course will be deemed consent to this disclosure. If you have any questions or concerns about this disclosure please discuss this with the course instructor. Avenue can be accessed via [http://avenue.mcmaster.ca](http://avenue.mcmaster.ca).

### Communications

It is the student’s responsibility to:
- Maintain current contact information with the University, including address, phone numbers, and emergency contact information.
- Use the University provided e-mail address or maintain a valid forwarding e-mail address.
- Regularly check the official University communications channels. Official University communications are considered received if sent by postal mail, by fax, or by e-mail to the student’s designated primary e-mail account via their @mcmaster.ca alias.
- Accept that forwarded e-mails may be lost and that e-mail is considered received if sent via the student’s @mcmaster.ca alias.
- Check the McMaster/Avenue email and course websites on a regular basis during the term.

### Turnitin (Optional)

This course will be using a web-based service (Turnitin.com) to reveal plagiarism. Students submit their assignment/work electronically to Turnitin.com where it is checked against the internet, published works and Turnitin’s database for similar or identical work. If Turnitin finds similar or identical work that has not been properly cited, a report is sent to the instructor showing the student’s work and the original source. The instructor reviews what Turnitin has found and then determines if he/she thinks there is a problem with the work. Students who do not wish to submit their work to Turnitin.com must still submit a copy to the instructor. No penalty will be assigned to a student who does not submit work to Turnitin.com. All submitted work is subject to normal verification that standards of academic integrity have been upheld.
(e.g., on-line search, etc.). To see the Turnitin.com Policy, please go to
http://www.mcmaster.ca/academicintegrity/turnitin/students/

**Protection of Privacy Act (FIPPA)**

The Freedom of Information and Protection of Privacy Act (FIPPA) applies to universities. Instructors should take care to protect student names, student numbers, grades and all other personal information at all times. For example, the submission and return of assignments and posting of grades must be done in a manner that ensures confidentiality.

http://www.mcmaster.ca/univsec/fippa/fippa.cfm

**Academic Accommodation of Students with Disabilities Policy**

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 905-525-9140 ext. 28652 or e-mail sas@mcmaster.ca. For further information consult McMaster’s policy for Academic Accommodation of Students with Disabilities


Students must forward a copy of the SAS accommodation to the instructor of each course and to the Program Administrator of the B.Tech. Program immediately upon receipt. If a student with a disability chooses NOT to take advantage of a SAS accommodation and chooses to sit for a regular exam, a petition for relief may not be filed after the examination is complete. http://sas.mcmaster.ca

**Student Code of Conduct**

The Student Code of Conduct (SCC) exists to promote the safety and security of all the students in the McMaster community and to encourage respect for others, their property and the laws of the land. McMaster University is a community which values mutual respect for the rights, responsibilities, dignity and well-being of others. The purpose of the Student Code of Conduct is to outline accepted standards of behavior that are harmonious with the goals and the well-being of the University community, and to define the procedures to be followed when students fail to meet the accepted standards of behavior. All students have the responsibility to familiarize themselves with the University regulations and the conduct expected of them while studying at McMaster University.

http://judicialaffairs.mcmaster.ca/pdf/SCC.pdf