Bachelor of Technology Partnership

Course Outline

1. COURSE INFORMATION

Session Offered	Winter 2017	
Course Name	Electricity & Electronics 1	
Course Code	ENG TECH 1EL3	
Date(s) and Time(s) of lectures	C01 (Soliman): Mo 10:30AM - 12:30PM, T13 107 We 8:30AM - 10:30AM, ETB 238 C02 (Fakhr): Mo 12:30PM - 2:30PM, T13 106 We 12:30PM - 2:30PM, T13 106 C03 (Soliman): We 4:30PM - 6:30PM, ETB 235 Fr 9:30AM - 11:30AM, ETB 238 C04 (Bakr): Tu 4:30 pm-6:30 pm, ETB 238 Th 4:30 pm-6:30 pm, ETB 238 C05 (Rickard): Mo 10:30AM - 12:30PM, ETB B104 We 8:30AM - 10:30AM, T13 107	
Program Name	Automotive and Vehicle Technology / Biotechnology / Process Automation Technology	
Calendar Description	Introduction to electronic circuits; DC and AC sources, resistors, inductors, and capacitors; phasors and impedance; transient and steady-state analysis; network analysis; energy and power	
Instructor(s)	Lecture Sections: Mostafa Soliman (C01, C03) Ahmed Fakhr (C02) Mohamed Bakr (C04) Yotka Rickard (C05) Lab Sections: Mandeep Saini (L01, L13, L14) Yotka Rickard (L02) Ahmed Fakhr (L03, L04) Mostafa Soliman (L05, L12) Mehdi Alimardani (L06, L09) Hassanain Awadh (L07, L08, L10, L11)	**E-Mail:** Alimardani: alimarm@mcmaster.ca Awadh: hawadh@mcmaster.ca Bakr: mbakr@mcmaster.ca Fakhr: fakhrad@mcmaster.ca Rickard: yotka@mcmaster.ca Saini: sainima@mcmaster.ca Soliman: solimm12@mcmaster.ca **Office Hours & Location:** Rickard (ETB 209): Mon 3:30 pm-4:30 pm and Thurs 5:30 pm-6:30 pm Soliman: Mon 1:00 pm-3:00 pm & by appointment Others: By appointment

2. COURSE SPECIFICS

Course Description	

<table>
<tr><td rowspan="6">Instruction Type</td><td>Code</td><td colspan="2">Type</td><td>Hours per term</td></tr>
<tr><td>C</td><td colspan="2">Classroom instruction</td><td>50</td></tr>
<tr><td>L</td><td colspan="2">Laboratory, workshop or fieldwork</td><td>36</td></tr>
<tr><td>T</td><td colspan="2">Tutorial</td><td></td></tr>
<tr><td>DE</td><td colspan="2">Distance education</td><td></td></tr>
<tr><td colspan="3">Total Hours</td><td>86</td></tr>
<tr><td rowspan="4">Resources</td><td colspan="2">ISBN</td><td>Textbook Title & Edition</td><td>Author & Publisher</td></tr>
<tr><td colspan="2">ISBN: 9780199008063</td><td>Fundamentals of Electric Circuits with lab manual, 7th ed.</td><td>David Bell. Oxford University Press.</td></tr>
<tr><td colspan="4">Note: the Campus store carries a limited number of the package listed above. They also carry the lab manual by itself without the textbook. The ISBN for the lab manual is 9780195430363. As a student, you make your own choice as to the resources you purchase. We will rely heavily on the textbook in this course. The weekly online quizzes are based on assigned reading from the text. Weekly practice problems will be recommended from the text and their solutions posted. And we will closely follow the textbook material in teaching the course.</td></tr>
<tr><td colspan="2">Other Supplies</td><td colspan="2">ENGTECH 1EL3 Electronics Kit w/ protoboard & wire hook up Found at the Titles Bookstore.</td></tr>
<tr><td>Prerequisite(s)</td><td colspan="4">Registration in B. Tech. I.</td></tr>
<tr><td>Corequisite(s)</td><td colspan="4">N/A</td></tr>
<tr><td>Antirequisite(s)</td><td colspan="4">N/A</td></tr>
<tr><td>Course Specific Policies</td><td colspan="4">Students are expected to attend labs starting on the first day of classes (Wednesday, January 4th). Furthermore, students are expected to have purchased their lab kits and their lab manuals prior to their first lab.

Students will have one week after a lab experiment to submit their lab reports. The lab reports must be submitted within the first 15 minutes of the start of the subsequent lab session. The lab report may be submitted late at a penalty of 10% per day up to a maximum of 70% off, or seven days late. If a report is submitted after the seven day late period, the report will receive a mark of zero. One lab report will be submitted per group. Students that miss a lab will require an official exemption, i.e. MSAF, to avoid receiving a mark of zero. Otherwise, the lab may be omitted from the final lab mark, or a makeup lab session may be held if possible. Lab attendance is mandatory to receive marks for the lab reports.

Students will write two lab tests that are 80 minutes each. The lab tests will be conducted individually in the labs. One partner will take the test in the first half of the lab session, while the other partner will take the test in the second half of the lab session.

Students will write 12 quizzes (roughly one per week), where the best 10 out of 12 will be counted toward their final mark. Furthermore, students will write 4 tests in the term. The test mark will be based on the best 3 out of the 4 tests provided all four tests have been submitted.

Any missed tests will require official exemptions, i.e. MSAF, in order to avoid receiving a mark of zero for the missed work. A first missed test will count as the dropped mark. Subsequent missed tests will be rewritten at the end of the term (date to be announced later) in the form of either another test on that specific</td></tr>
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	topic or an aggregate test consisting of all topics for the whole term. The specifics will be announced later in the term. MSAF tests may be given in any format, including traditional written tests or oral examinations. Tests may be resubmitted to their instructors for re-mark up to one week after the test has been returned to the students. Students must submit a detailed written description of the marking problem along with the test. However, the instructors have the right to remark the test in its entirety.	
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)		
Week 1	**CHAPTER 1 Basics of Electricity** 1.1 Electrification by Friction 1.2 Voltage, Current, and Resistance 1.3 Basic Source of Electricity 1.4 Electric Lamp 1.5 Electric Circuit 1.6 Current Direction 1.7 Direct Current and Alternating Current 1.8 Electric Shock **CHAPTER 2 Measuring Current, Voltage and Resistance** 2.1 Metric Prefixes and Engineering Notation 2.2 Current Measurement 2.3 Voltage Measurement 2.4 Resistance Measurement **CHAPTER 3 Ohm's Law and Electrical Calculations** 3.1 Resistance 3.2 Ohm's Law 3.3 Applications of Ohm's Law 3.4 Conductance 3.5 Electrical Power and Energy	Ch1, Ch2, Ch3
Week 2	**CHAPTER 5 Series Resistor Circuits** 5.1 Series Resistor Circuits 5.2 Voltages in a Series (Kirchhoff's Voltage Law) 5.3 Voltage Divider	Ch5

	5.4 Potentiometer 5.5 Power in a Series Circuit 5.6 Voltage Dropping and Current Limiting 5.7 Open Circuits and Short-Circuits in Series Circuits	
Week 3	**CHAPTER 6 Parallel Resistor Circuits** 6.1 Parallel Resistor Circuits (Kirchhoff's Current Law) 6.2 Parallel Equivalent Circuit 6.3 Conductances in Parallel 6.4 Current Divider 6.5 Power in Parallel Circuits 6.6 Open-Circuits and Short-Circuits in Parallel Circuits **CHAPTER 7 Series-Parallel Resistor Circuits** 7.1 Series- Parallel Resistor Circuits 7.2 Currents in a Series-Parallel Circuit 7.3 Voltage Drops in a Series-Parallel Circuit 7.4 Ladder Networks 7.5 Analysis of Series-Parallel Resistor Circuits	Ch6, Ch7
Week 4	**Jan 30th : Test #1 - Covers all topics up to and including Chapter 7.** **CHAPTER 8 Network Analysis Techniques** 8.1 Voltage Sources and Current Sources 8.2 Network Analysis Using Kirchhoff's Laws 8.3 Loop Equations (Mesh Analysis) 8.4 Nodal Analysis	Ch8
Week 5	**CHAPTER 9 Network Theorems** 9.1 The Superposition Theorem 9.2 Thevenin's Theorem 9.3 Norton's Theorem 9.4 Millman's Theorem 9.5 Maximum Power Transfer Theorem	Ch9
Week 6	**Test #2 - Covers all topics up to and including Chapter 9. Feb 13th** **CHAPTER 15 Capacitance** 15.1 Electric Charge Storage 15.2 Electric Field 15.3 Capacitance and Capacitor Dimensions 15.5 Capacitors in Series and in Parallel 15.6 Energy Stored in Charged Capacitor	Ch15
Mid-term Recess: Monday, February 20 to Sunday, February 26, 2017		
Week 7	**CHAPTER 16 Capacitance in DC Circuits** 16.5 RC Circuit operation 16.6 Instantaneous Current and Voltage in RC Circuits 16.7 Discharging a Capacitor 16.8 RC Circuit Waveforms **CHAPTER 14 Inductance** 14.1 Electromagnetic Induction 14.2 Induced EMF and Current 14.3 Self – Inductance	Ch16, Ch14

Week 8	**CHAPTER 14 Inductance** 14.5 Energy Stored in an Inductive Circuit 14.6 Inductors in Series and in Parallel **CHAPTER 16 Inductance in DC Circuits** 16.1 RL Circuit Operation 16.2 Instantaneous Current and Voltage in RL Circuits 16.3 Open Circuiting an Inductive Circuit 16.4 RL Circuit Waveforms	Ch14, Ch16
Week 9	**March 13: Test #3 - Covers all topics up to and including Chapter 16.** **CHAPTER 17 Alternating Current and Voltage** 17.3 Frequency, Phase Angle, and Wavelength 17.4 Resistive Load with AC Supply 17.5 Peak, Average and RMS Values of Sine Waves CHAPTER 18 Phasors and Complex Numbers 18.1 Phasor Representation of Alternating Voltage 18.2 Addition and Subtraction of Phasors	Ch 17, Ch18
Week 10	**CHAPTER 18 Phasors and Complex Numbers** 18.3 Polar and Rectangular Forms, the j operator 18.4 Mathematics of Complex Quantities **CHAPTER 19 Inductance and Capacitance in AC Circuits** 19.1 Alternating Current and Voltage in an Inductive Circuit 19.2 Inductive Reactance and Susceptance 19.3 Alternating Current and Voltage in a Capacitive Circuit 19.4 Capacitive Reactance and Susceptance 19.5 Series RL Circuits 19.6 Series RC Circuits	Ch18, Ch19
Week 11	**CHAPTER 19 Inductance and Capacitance in AC Circuits** 19.7 Series RLC Circuits 19.8 Parallel RL Circuits 19.9 Parallel RC Circuits 19.10 Parallel RLC Circuits **CHAPTER 20 Series and Parallel AC circuits** 20.1 Series-Connected Impedances 20.2 AC Voltage Divider 20.3 Impedances in Parallel 20.4 AC Current Divider 20.5 Series-Parallel Impedances 20.6 Series and Parallel Equivalent Circuits	Ch19, Ch20
Week 12	**April 3rd: Test #4 - Covers all topics up to and including Week 10** **CHAPTER 21 Power in AC Circuits** 21.1 Power Dissipated in a Resistance 21.2 Power in an Inductance 21.3 Power in a Capacitance 21.4 True Power and Reactive Power 21.5 Power in RL and RC Circuits	Ch21

	21.6 Power Factor	
Classes end: Thursday, April 6, 2017 Final examination period: Tuesday, April 11 to Thursday, April 27, 2017 All examinations MUST be written during the scheduled examination period.		
List of experiments		
Week 1: Introduction	Equipment Familiarization, Soldering Exercise , Using Digital and Analog Multimeters	
Week 2: Lab 2	Ohm's Law	
Week 3: Lab 3	Series Resistive Circuits	
Week 4: Lab 4	Parallel Resistive Circuits	
Week 5: Lab 5 & Lab 13	Series-Parallel Circuits Wheatstone Bridge	
Week 6	**Lab test 1**	
Mid-term Recess: Monday, February 20 to Sunday, February 26, 2017		
Week 7: Lab 6	Resistive Networks	
Week 8: Lab 7	Network Theorems	
Week 9: Lab 15 and Lab 14	Oscilloscope DC RC Circuit	
Week 10: Lab 17 and Lab 18	AC RL Circuit AC RC Circuit	
Week 11	**Lab Test 2**	
Week 12	Make-up labs if needed	
Extra Lab (time permitting): Lab 19	Series and Parallel Impedance Circuits	
	The labs will start on Thursday, January 5th, 2017. Students are expected to have purchased their lab kits and their lab manuals prior to the commencement of their first lab.	
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*	**Weight**
Quizzes (Best 10 of 12, worth 1% each)	**10%**
4 Term Tests (Best 3 of 4 provided all 4 are submitted, worth 10% each)	**30%**
Lab Tests (worth 7.5% each)	**15%**
Lab Reports (9 reports total)	**15%**
Final examination (tests cumulative knowledge)	**30%**
TOTAL	**100%**
Percentage grades will be converted to letter grades and grade points per the University calendar.	

5. LEARNING OUTCOMES
1. Construct mathematical models for linear, R,L,C circuits.
2. Construct physical circuit implementations during lab exercises as well as test and monitor the circuit variables using digital multimeters and oscilloscopes.
3. Mathematically analyze R,L,C circuits to discern their behaviour and to quantify their electrical variables.
4. Apply MultiSim software to simulate circuit behaviour.
5. Apply complex analysis techniques, including phasors and impedances, to study AC circuit behaviour.

6. Understand the fundamental physical laws as they apply to electricity and electronics.

7. Illustrate practical applications for circuits and electronics.

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.
http://www.mcmaster.ca/policy/General/HR/Discrimination_Harassment_Sexual_Harassment-Prevention&Response.pdf

Academic Integrity

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

Academic dishonesty is to knowingly act of 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 .

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 an on-line self-reporting tool for **Undergraduate Students** to report absences for:

1) Relief for missed academic work worth less than 25% of the final grade resulting from medical or personal situations lasting up to three calendar days:

   - Students may submit a maximum of one academic work missed request per term. It is the responsibility of the student to follow up with instructors immediately (within the 3 day period that is specified in the MSAF) regarding the nature of the accommodation. All work due in that time period however can be covered by one MSAF.
   - MSAF cannot be used to meet religious obligation or celebration of an important religious holiday, for that has already been completed or attempted or to apply for relief for any final examination or its equivalent.

2) For medical or personal situations lasting more than three calendar days, and/or for missed academic work worth 25% or more of the final grade, and/or for any request for relief in a term where the MSAF has not been used previously in that term:

   - Students must visit their Associate Dean's Office (Faculty Office) and provide supporting documentation.

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.

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
http://www.mcmaster.ca/policy/Students-AcademicStudies/AcademicAccommodation-StudentsWithDisabilities.pdf

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://studentconduct.mcmaster.ca/student_code_of_conduct.html