

Course Outline (W2024)

EES512: Electric Circuits

Instructor(s)	Dr. Farah Mohammadi [Coordinator] Office: ENG461 Phone: (416) 979-5000 x 556094 Email: fmohamma@torontomu.ca Office Hours: Tuesdays 2 to 4 pm
Calendar Description	This one-semester lecture/lab course covers general electric circuit parameters and laws. Topics include: basic electric circuits, voltage and current sources, resistance, analysis of DC circuits, power considerations. Concepts of capacitance, inductance, and their transient behaviour. Introduction of AC sources, phasors, reactance and impedance, AC analysis of RC, RL, and RCL circuits, the effect of resonance, real and complex power in reactive loads.
Prerequisites	MTH140 and MTH141
Antirequisites	None
Corerequisites	None
Compulsory Text(s):	<ol style="list-style-type: none"> 1. EES512 Laboratory: Laboratory Manual by A. O'Halloran and K. Raahemifar, posted online on D2L. 2. Web Pages: EES 512 D2L
Reference Text(s):	<ol style="list-style-type: none"> 1. Fundamentals of Electric Circuits, 7th Edition by C.K. Alexander & M.N. Sadiku, published by McGraw-Hill. Chapter 1-11. 2. ELE202: Lecture Notes, The lecture notes are available on D2L
Learning Objectives (Indicators)	<p>At the end of this course, the successful student will be able to:</p> <ol style="list-style-type: none"> 1. Understand, interpret, articulate, and apply the basic voltage and current laws in the identification, formulation, and solution of the basic problem of circuit analysis. (1a) 2. Develop linear equations based on different circuit configurations. Solve linear equations using variable elimination or Cramer rule. (1b) 3. Conduct experiments using the basic principles of circuit analysis and analyze and interpret the obtained results. (2a) 4. Use current and voltage measurement instruments, including volt/current meters and oscilloscope to measure the voltage and current characteristics of various circuits. (5a) <p>NOTE: Numbers in parentheses refer to the graduate attributes required by the Canadian Engineering Accreditation Board (CEAB).</p>
Course Organization	3.0 hours of lecture per week for 13 weeks 2.0 hours of lab per week for 12 weeks 0.0 hours of tutorial per week for 12 weeks

Teaching Assistants	TBA																
Course Evaluation	<table border="1" data-bbox="427 243 1351 711"> <thead> <tr> <th colspan="2" data-bbox="427 243 1351 302">Theory</th> </tr> </thead> <tbody> <tr> <td data-bbox="427 302 1154 361">Midterm</td> <td data-bbox="1154 302 1351 361">25 %</td> </tr> <tr> <td data-bbox="427 361 1154 420">Final Exam</td> <td data-bbox="1154 361 1351 420">45 %</td> </tr> <tr> <th colspan="2" data-bbox="427 420 1351 478">Laboratory</th> </tr> <tr> <td data-bbox="427 478 1154 537">Lab Tests</td> <td data-bbox="1154 478 1351 537">15 %</td> </tr> <tr> <td data-bbox="427 537 1154 596">Lab Reports</td> <td data-bbox="1154 537 1351 596">10 %</td> </tr> <tr> <td data-bbox="427 596 1154 655">Quizzes (in Lab)</td> <td data-bbox="1154 596 1351 655">5 %</td> </tr> <tr> <td data-bbox="427 655 1154 711">TOTAL:</td> <td data-bbox="1154 655 1351 711">100 %</td> </tr> </tbody> </table> <p data-bbox="310 768 1461 947">Note: In order for a student to pass a course, a minimum overall course mark of 50% must be obtained. In addition, for courses that have both "Theory and Laboratory" components, the student must pass the Laboratory and Theory portions separately by achieving a minimum of 50% in the combined Laboratory components and 50% in the combined Theory components. Please refer to the "Course Evaluation" section above for details on the Theory and Laboratory components (if applicable).</p>	Theory		Midterm	25 %	Final Exam	45 %	Laboratory		Lab Tests	15 %	Lab Reports	10 %	Quizzes (in Lab)	5 %	TOTAL:	100 %
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Examinations	<p data-bbox="310 1035 1380 1094">1. The midterm is scheduled on Monday, March 4th, 2024 during regular lecture hours. The duration will be 2 hours.</p> <p data-bbox="310 1094 1409 1211">2. The official final exam will be announced by the timetabling department. The final exam includes materials discussed from the beginning to the end. The duration will be 3 hours. Refer to the course webpage on D2L for updated information on the Midterm and Final Exam schedules and coverage.</p>																
Other Evaluation Information	<p data-bbox="310 1243 1458 1386">1. Students are encouraged to earn passing marks in both theory and lab components separately. In the absence of student's lab portions with valid reasons and proper documents submitted and verified by student's department, the grades will be shifted to final exam. As labs are hands-on, earning lab grades during the term is a lot simpler than compensating lab grades in final exam.</p> <p data-bbox="310 1386 1052 1417">Lab reports should be handed in the week after the labs.(10%)</p> <p data-bbox="310 1417 1466 1633">2. There are lab tests that are conducted individually. There are two lab tests worth a total of 15%. The first lab test is conducted after labs 1 to 3 are completed. It is worth 8%. The second lab test is conducted after labs 4 and 5 are completed. It is worth 7%. Lab tests are scheduled for one hour per person and have small pre-lab, implementation, and post- lab reports handed in. These test reports are written per person, will be marked and posted online. There is no question asked policy for lab tests. Students must use actual lab sessions as their practice run, as there is no practice lab prior to the tests</p> <p data-bbox="310 1633 1398 1730">3. Only university-approved calculators are allowed. Also, both midterm and final exams are no-question-asked exams. Only the non-programmable approved calculator (Sharp EL546 or Casio fx-991MS and their later models) will be allowed.</p>																
Other Information	None																

Course Content

Week	Hours	Chapters / Section	Topic, description
1-2	6	1	Introduction to EES512: scope and objectives course management. Basic concepts charge current voltage power reference direction resistance and Ohm's Law power dissipation characteristics of resistors.
3-5	9	2, 3, & 4	Series and parallel circuits Kirchhoff's Laws ground potential voltage and current division principles Wheatstone bridge ideal and real voltage sources Nodal Mesh Superposition and Source Transformation Techniques Thevenin's and Norton theorems maximum power transfer and power transfer efficiency.
6-8	9	6 & 7	Capacitance practical capacitors series and parallel connections transients in RC circuits. Self-inductance series and parallel connections transients in RL circuits time constants and graphical representations.
9-10	6	9,10,11	Generation of AC voltages parameters of AC waveforms average and effective (RMS) values review of complex number algebra phasor representation impedance and admittance capacitive and inductive reactance.
11-13	9	course notes	Series R-L R-C and R-L- C loads general series-parallel AC circuits. Phasor analysis of AC currents voltage and phase shifts.

Laboratory(L)/Tutorials(T)/Activity(A) Schedule

Week	L/T/A	Description
2	Weeks of Jan.16	Tutorial 1 and Quiz1
3	Week of Jan. 23	Lab 1.1 Ohm's Law Lab 1.2 " Series Circuits and Kirchhoff's Voltage Law Lab1.3 " Parallel Circuits and Kirchhoff's Current Law

4	Week of Jan. 30	Tutorial 2 and Quiz 2
5	Week of Feb. 6	Lab 2: Nodal Analysis
6	Week of Feb. 13	Tutorial 3 and Quiz3
7	Week of Feb. 27	Lab 3.1- Thevenin Theorem Lab 3.2- Power Transfer
8	Week of Mar. 6	Lab test 1
9	Week of Mar. 13	Tutorial 4 and Quiz 4
10	Week of Mar. 20	Lab 4.1 - RC Circuit Step Response Lab 4.2 - RL Circuit Step Response
11	Week of March 27	Lab 5 - RLC Circuit Resonance
12	Week of April	Lab Test2

University Policies & Important Information

Students are reminded that they are required to adhere to all relevant university policies found in their online course shell in D2L and/or on [the Senate website](#)

Refer to the [Departmental FAQ page](#) for further information on common questions.

Important Resources Available at Toronto Metropolitan University

- [The Library](#) provides research [workshops](#) and individual assistance. If the University is open, there is a Research Help desk on the second floor of the library, or students can use the [Library's virtual research help service](#) to speak with a librarian.

- [Student Life and Learning Support](#) offers group-based and individual help with writing, math, study skills, and transition support, as well as [resources and checklists to support students as online learners](#).
- You can submit an [Academic Consideration Request](#) when an extenuating circumstance has occurred that has significantly impacted your ability to fulfill an academic requirement. You may always visit the [Senate website](#) and select the blue radio button on the top right hand side entitled: **Academic Consideration Request (ACR)** to submit this request.

For Extenuating Circumstances, Policy 167: Academic Consideration allows for a once per semester ACR request without supporting documentation if the absence is less than 3 days in duration and is not for a final exam/final assessment. Absences more than 3 days in duration and those that involve a final exam/final assessment, require documentation. Students must notify their instructor once a request for academic consideration is submitted. See Senate [Policy 167: Academic Consideration](#).

- If a student is requesting accommodation due to a religious, Aboriginal and/or spiritual observance, they must submit their request via the online [Academic Consideration Request \(ACR\) system](#) **within the first two weeks of the class or, for a final examination, within two weeks of the posting of the examination schedule**. If the required absence occurs within the first two weeks of classes, or the dates are not known well in advance as they are linked to other conditions, these requests should be submitted with as much lead time as possible in advance of the required absence.
- If taking a remote course, familiarize yourself with the tools you will need to use for remote learning. The [Remote Learning Guide](#) for students includes guides to completing quizzes or exams in D2L Brightspace, with or without [Respondus LockDown Browser and Monitor, using D2L Brightspace](#), joining online meetings or lectures, and collaborating with the Google Suite.
- Information on Copyright for [Faculty](#) and [students](#).

Accessibility

- Similar to an [accessibility statement](#), use this section to describe your commitment to making this course accessible to students with disabilities. Improving the accessibility of your course helps minimize the need for accommodation.
- Outline any technologies used in this course and any known accessibility features or barriers (if applicable).
- Describe how a student should contact you if they discover an accessibility barrier with any course materials or technologies.

Academic Accommodation Support

Academic Accommodation Support (AAS) is the university's disability services office. AAS works directly with incoming and returning students looking for help with their academic accommodations. AAS works with any student who requires academic accommodation regardless of program or course load.

- Learn more about [Academic Accommodation Support](#).
- Learn [how to register with AAS](#).

Academic Accommodations (for students with disabilities) and Academic Consideration (for students faced with extenuating circumstances that can include short-term health issues) are governed by two different university policies. Learn more about [Academic Accommodations versus Academic Consideration and how to access each](#).

Wellbeing Support

At Toronto Metropolitan University, we recognize that things can come up throughout the term that may interfere with a student's ability to succeed in their coursework. These circumstances are outside of one's control and can have a serious impact on physical and mental well-being. Seeking help can be a challenge, especially in those times of crisis.

If you are experiencing a mental health crisis, please call 911 and go to the nearest hospital emergency room. You can also access these outside resources at anytime:

- **Distress Line:** 24/7 line for if you are in crisis, feeling suicidal or in need of emotional support (phone: 416-408-4357)
- **Good2Talk:** 24/7-hour line for postsecondary students (phone: 1-866-925-5454)
- **Keep.meSAFE:** 24/7 access to confidential support through counsellors via [My SSP app](#) or 1-844-451-9700

If non-crisis support is needed, you can access these campus resources:

- **Centre for Student Development and Counselling:** 416-979-5195 or email csdc@torontomu.ca
- **Consent Comes First - Office of Sexual Violence Support and Education:** 416-919-5000 ext 3596 or email osvse@torontomu.ca
- **Medical Centre:** call (416) 979-5070 to book an appointment

We encourage all Toronto Metropolitan University community members to access available resources to ensure support is reachable. You can find more resources available through the [Toronto Metropolitan University Mental Health and Wellbeing](#) website.