

## Course Outline (W2024)

### ELE637: Energy Conversion

<b>Instructor(s)</b>	Dr. Richard Cheung [Coordinator] Office: ENG330 Phone: (416) 979-5000 x 556112 Email: cheung@torontomu.ca Office Hours: Tuesdays 4pm-5pm
<b>Calendar Description</b>	Basic principles of operation of different types of machines and their control; magnetic circuit analysis, single-phase, and three-phase transformers, principles of electromechanical energy conversion, DC machines, three-phase induction motors, synchronous machines, introduction to solid-state motor controls and devices, transients and dynamics of machines, introduction to programmable logic controller (PLC), control of electric motors by PLC.
<b>Prerequisites</b>	ELE 302 and ELE 531
<b>Antirequisites</b>	None
<b>Corerequisites</b>	None
<b>Compulsory Text(s):</b>	1. P.C. Sen, Principles of Electric Machines and Power Electronics, 3rd Edition, John Wiley and Sons, ISBN: 978-1-118-07887-7, 2013.
<b>Reference Text(s):</b>	1. G.R. Slemon, Electric Machines and Drives, Addison-Wesley, ISBN-13: 978-0201578850, 1992.
<b>Learning Objectives (Indicators)</b>	<p>At the end of this course, the successful student will be able to:</p> <ol style="list-style-type: none"> <li>1. Apply engineering fundamentals (Ampere's Law, Faraday's Law, Ohm's Law, etc.) to solve electromagnetic engineering problems. Apply electromagnetic and electromechanical engineering principles to solve energy conversion engineering problems. <b>(1c)</b></li> <li>2. Use engineering fundamentals to formulate models for magnetic devices, transformers, dc machines, induction machines, and synchronous machines. Use the models to solve real-world engineering problems on electromagnetic circuits, transformers and electric machines. Address the limitations of the models. <b>(2b)</b></li> <li>3. Determine the limitations of laboratory measurements on magnetic components, transformers, and electric machines. Verify the models of magnetic devices, transformers, and electric machines with laboratory measurements. <b>(3b), (3a)</b></li> <li>4. Select the best proceeds to achieve various design objectives on energy conversion and decide the optimal designs of electromagnetic and electromechanical transformations subjected to various real-world engineering conditions. <b>(4c)</b></li> <li>5. Evaluate and select appropriate equipment and test apparatus for measuring electromagnetic circuits, transformers, electric machines. <b>(5a)</b></li> <li>6. Understand the impact of electric machines to the sustainable development. Know the relevant regulations in the engineering activities. <b>(9a)</b></li> </ol>

7. Using the professional and ethical protocols and procedures when performing the experiments with high voltage, including the safety considerations. (10a)

**NOTE:** Numbers in parentheses refer to the graduate attributes required by the Canadian Engineering Accreditation Board (CEAB).

**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**

012 Thursday 8am-11am, Eren Alli  
022 Thursday 12noon-3pm, Negar Karimipour  
032 Monday 8am-11am, Md Nooruzzaman  
042 Tuesday 8am-11am, Eren Alli  
052 Friday 8am-11am, Eren Alli  
062 Wednesday 8am-11am, Eren Alli  
072 Friday 11am-2pm, Negar Karimipour

**Course Evaluation**

<b>Theory</b>	
Midterm Exam	25 %
Final Exam	45 %
<b>Laboratory</b>	
Lab Reports	15 %
Lab Work	15 %
<b>TOTAL:</b>	<b>100 %</b>

**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).

**Examinations**

Midterm exam is on Tuesday, February 13 for a duration of three hours.  
Midterm exam will cover lecture materials up to and including Lecture on February 6.  
  
Final exam is to be held during the exam period for a duration of three hours.  
Final exam will cover all the topics in this course.

**Other Evaluation Information**

None

**Teaching Methods**

In-Person for lectures, labs and all the examinations and evaluations.

**Other Information**

None

## Course Content

Week	Hours	Chapters / Section	Topic, description
1-2	4	1	Topic 1: Magnetic Circuits
2-3	4	2	Topic 2: Transformers
3-6	8		Topic 3: DC Machines
6-8	8	4	Topic 4: Induction Machines
9-10	6	5	Topic 5: Synchronous Machines
11-12	6	6	Topic 6: Other Motors

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

Week	L/T/A	Description
1-2	ENG309	Tutorial (1 hour): Lab tutorial on Three-phase Power Measurements Lab Work (3 hours): Three-phase Power Measurements
3-4	ENG309	Tutorial (1 hour): Lab tutorial on Transformers Lab Work (3 hours): Three-phase Transformer Measurement
5-8	ENG309	Tutorial (1 hour): Lab tutorial on DC motors Lab Work (3 hours): A: DC Motor Measurements B: Induction Motor Measurements Tutorial (1 hour): Lab tutorial on Induction Motors

		Lab Work (3 hours): A: Induction Motor Measurements B: DC Motor Measurements
9-12	ENG309	Tutorial (1 hour): Lab tutorial on Synchronous Generators Lab Work (3 hours): A: Synchronous Generator Measurements B: PLC Experiment Tutorial (1 hour): Lab tutorial on PLC Lab Work (3 hours): A: PLC Experiment B: Synchronous Generator Measurements

## 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](mailto:csdc@torontomu.ca)
- **Consent Comes First - Office of Sexual Violence Support and Education:** 416-919-5000 ext 3596 or email [osvse@torontomu.ca](mailto: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.