

## COURSE OUTLINE

### ECE 370– Electromechanical Energy Conversion

**Term – FALL 2019 (201909)**

#### Instructor

Dr. T. Ilamparithi  
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E-mail: ilampari@uvic.ca

#### Office Hours

Days: Thursdays  
Time: 10:00 AM to 12:00 Noon  
Location: EOW 407

#### Course Objectives

Almost entire electric power generation in the world is by rotating electrical machines. Further, more than 50% of total electricity consumption is by electrical machines. Electric machines, be they generators or motors, work on the principle of electromechanical energy conversion. Incidentally, a device called transformer used in electric power transmission, also works on the same principle. Thus, the objective of the course is to introduce you to the principles of electromechanical energy conversion, transformers and electric machines.

#### Learning Outcomes

By enrolling in ECE 370 and actively involving yourself in the learning process, you shall be able to

- 1) Draw magnetic equivalent circuits and analyze them to calculate parameters like flux, flux density, etc.
- 2) Discuss the effect of eddy currents and hysteresis in transformers and electrical machines.
- 3) Explain the basic principles of operation and construction details of transformers, dc machines, ac machines (3-phase induction and synchronous machines) and develop their practical equivalent circuits.
- 4) Use equivalent circuits in calculating the performance parameters of transformers, dc machines and ac machines.
- 5) Carry out measurements of the equivalent circuit parameters of transformer, dc machine and induction machine in the laboratory; also predict and measure the performance parameters like efficiency, regulation, etc.
- 6) Measure and sketch the speed-torque characteristics of dc motors and induction motors and compare with predicted characteristics; learn to control their speed.
- 7) Analyze a power factor correction setup that uses synchronous machines.
- 8) Demonstrate communication skills through lab reports documenting team-based experiential work carried out in the lab.

#### Syllabus

Topic (approximate number of lectures)	Make-up lecture details
Magnetic Circuits ( 5 lectures)	Sept 12 (Thursday), 4:30 – 5:50 PM, ELL 168
Transformers (8 lectures)	Sept 19 (Thursday), 4:30 – 5:50 PM, ELL 168
DC Machines (8 lectures)	Oct 4 (Friday), 1:30 – 2:50 PM, DTB A104
Induction Motors (7 lectures)	
Synchronous Machines (6 lectures)	
Electromechanical Energy Conversion Principles (2 lectures)	
Stepper Motor and Brushless DC Machines (1 lecture)	
Introduction to Electric Drives (1 lecture)	

**Note 1:** To help prepare you for labs, a few make-up classes are scheduled outside the regular hours.

**Note 2:** There will be no lectures on 16<sup>th</sup> October and 18<sup>th</sup> October.

## Lecture

A-Section(s): A01 / CRN 10977

Days: Tuesdays, Wednesdays & Fridays

Time: 11:30 AM to 12:30 PM

Location: Engineering Computer Science (ECS) 116

## Laboratory

Labs do not commence until 23rd September.

Schedule will be provided in the first week of classes.

## Required Textbooks

- 1) Title: Principles of Electric Machines and Power Electronics  
Author: P. C. Sen  
Publisher: John Wiley & Sons  
Year: Third edition, 2013
- 2) Title: Laboratory Manual for ECE 370 - Electromechanical Energy Conversion  
Author: A. K. S. Bhat  
Publisher: University of Victoria  
Year: 2019

Print version of the manual is mandatory for the lab and can be procured from the Uvic Bookstore

## Assessment:

Validating one's learning is important and hence in ECE 370, many opportunities will be provided to you to assess your learning. In order to ensure you have enough time to take appropriate corrective actions upon assessing, I propose the following periodic assessment scheme:

Assignments:	5 x 02 = 10%	Due Dates: To be announced via CourseSpace
Labs	4 x 06 = 24%	Due Dates: To be announced via CourseSpace
Mid-term	1 x 16 = 16%	Date, Time & Venue: Nov 8 (Friday), 1:30 to 2:50 PM at DTB A104
Final Exam	1 x 50 = 50%	Date: To be announced via CourseSpace

## Note:

Failure to complete all laboratory requirements will result in a grade of N being awarded for the course.

The final grade obtained from the above marking scheme for the purpose of GPA calculation will be based on the percentage-to-grade point conversion table as listed in the current Undergraduate Calendar.

<https://web.uvic.ca/calendar2019-09/undergrad/info/regulations/grading.html>

There will be no supplemental examination for this course.

<https://web.uvic.ca/calendar2019-09/undergrad/info/regulations/exams.html#>

## Note to students:

Students who have issues with the conduct of the course should discuss them with the instructor first. If these discussions do not resolve the issue, then students should feel free to contact the Chair of the Department by email or the Chair's Assistant to set up an appointment.

## Course Withdrawal Deadlines:

- September 17: Withdrawal with 100% reduction of tuition fees
- October 8: Withdrawal with 50% reduction of tuition fees
- October 31: Last day for withdrawal (no fees returned)

## Accommodation of Religious Observance:

<https://web.uvic.ca/calendar2019-09/undergrad/info/regulations/religious-observanc.html>

## Policy on Inclusivity and Diversity:

<https://web.uvic.ca/calendar2019-09/general/policies.html>

**Standards of Professional Behaviour:**

You are advised to read the Faculty of Engineering document Standards for Professional Behaviour, which contains important information regarding conduct in courses, labs, and in the general use of facilities.

<https://www.uvic.ca/engineering/assets/docs/professional-behaviour.pdf>

Cheating, plagiarism and other forms of academic fraud are taken very seriously by both the University and the Department. You should consult the entry in the current Undergraduate Calendar for the UVic policy on academic integrity.

<https://web.uvic.ca/calendar2019-09/undergrad/info/regulations/academic-integrity.html>

**Equality:**

This course aims to provide equal opportunities and access for all students to enjoy the benefits and privileges of the class and its curriculum, and to meet the syllabus requirements. Reasonable and appropriate accommodation will be made available to students with documented disabilities (physical, mental, learning) in order to give them the opportunity to successfully meet the essential requirements of the course. The accommodation will not alter academic standards or learning outcomes, although the student may be allowed to demonstrate knowledge and skills in a different way. It is not necessary for you to reveal your disability and/or confidential medical information to the course instructor. If you believe that you may require accommodation, the course instructor can provide you with information about confidential resources on campus that can assist you in arranging an appropriate accommodation. Alternatively, you may want to contact the Centre for Accessible Learning located in the Campus Services Building.

The University of Victoria is committed to promoting, providing, and protecting a positive, supportive, and safe learning and working environment for all its members.

**Course Lecture Notes:**

Unless otherwise noted, all course materials supplied to students in this course are intended for use in this course only. These materials are NOT to be re-circulated digitally, whether by email or by uploading or copying to websites, or to others not enrolled in this course. Violation of this policy may in some cases constitute a breach of academic integrity as defined in the UVic Calendar.

**Sexualized Violence Prevention and Response at Uvic:**

UVic takes sexualized violence seriously, and has raised the bar for what is considered acceptable behaviour. We encourage students to learn more about how the university defines sexualized violence and its overall approach by visiting [www.uvic.ca/svp](http://www.uvic.ca/svp). If you or someone you know has been impacted by sexualized violence and needs information, advice, and/or support please contact the sexualized violence resource office in Equity and Human Rights (EQHR). Whether or not you have been directly impacted, if you want to take part in the important prevention work taking place on campus, you can also reach out:

**Where:** Sexualized violence resource office in EQHR; Sedgewick C119

**Phone:** 250.721.8021

**Email:** [svpcoordinator@uvic.ca](mailto:svpcoordinator@uvic.ca)

**Web:** [www.uvic.ca/svp](http://www.uvic.ca/svp)

**Office of the Ombudsperson:**

The [Office of the Ombudsperson](http://www.uvic.ca/ombudsperson) is an independent and impartial resource to assist with the fair resolution of student issues. A confidential consultation can help you understand your rights and responsibilities. The Ombudsperson can also clarify information, help navigate procedures, assist with problem-solving, facilitate communication, provide feedback on an appeal, investigate and make recommendations. Phone: 250-721-8357; Email: [ombuddy@uvic.ca](mailto:ombuddy@uvic.ca); Web: <https://uvicombudsperson.ca/>

**Continuous Feedback:** I am committed to a memorable learning experience for my students, and I will try my best to help out in whatever way I can. For that I need to receive your input throughout the course. Oral/written/email feedback any time during the course is welcome.