University of Victoria
Faculty of Engineering | Electrical and Computer Engineering
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COURSE OUTLINE

ECE 482 - Electrical Drive Systems

Term – SPRING 2021 (202101)

Instructor

Dr. Rouh Shafaei
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Office Hours

Days: Wednesdays and Thursdays
Time: 7:00 PM – 8:20 PM
Location/Platform/link: Zoom

Course Objectives

Electrical drive systems, as a cornerstone of modern industry, have been gaining more popularity over the years. The primary objective is to provide an overview of the principles of motor control and the application of power electronic converters in dc and ac motor drives.

Learning Outcomes

By enrolling in ELEC 482 and actively involving in the learning process, the students shall be able to:

- Define an electrical drive system
- Analyze fundamental of electric drive
- Develop models of key components of an electrical drive system
- Analyze and develop models for speed control of DC motors
- Analyze and develop models for induction motors
- Analyze the basis operation of different drive systems of an induction motor
- Analyze constant Volt/Hertz of AC machines
- Analyze variable voltage/freq. operations of AC machines
- Analyze synchronous motor drive
- Simulate drive systems using MATLAB/Simulink

Syllabus

Elements of drive systems, characterization of mechanical loads, requirements of electrical drive systems, dynamic equations and modelling of electrical machines, dc drives with various dc power sources, induction motor drives, ac controller, slip-energy recovery, constant air-gap flux, synchronous motor drives, permanent magnet motors, reluctance motors.

Lecture

A-Section(s): A01 / CRN 20927
Days: Wednesdays and Thursdays
Time: 7:00 PM – 8:20 PM
Location/Platform/link: Zoom - This course will be offered fully online and blended (a mix of “real-time” and asynchronous sessions).
We will have Wednesdays’ sessions mainly for real-time teaching/discussion, and Thursdays for asynchronous sessions.

Required Textbook

The required textbook will be provided during the sessions. Also, reference e-books will be used and addressed during the course to cover diverse related drive topics. Please, see reference section for more details.

The required materials will be provided through Brightspace. The required e-books are available in the UVIC library.

Online Course Delivery:
As this course will be conducted online during this term, students will need to complete assignments/project/final exam online. All materials need to be submitted online through Brightspace.
The students will require access to a computer which has the following software installed:

- MATLAB/Simulink, Student version (https://matlab.engr.uvic.ca/)
  Please install the following toolboxes in addition to MATLAB/Simulink.
  - ✓ Simscape Driveline
  - ✓ Simscape Electronics
  - ✓ Simscape Power Systems
- MS Office or equivalent
- Zoom capabilities [ideally a camera and microphone]

References:

The followings main references will be used for this course:

- "Advanced electric drives: analysis, control, and modeling using MATLAB/Simulink", Ned Mohan, Wiley, 2014. Available at https://voyager.library.uvic.ca/vwebv/holdingsInfo?bibId=4158636
- "Electric motors and drives: fundamentals, types and applications", Austin Hughesm,. Oxford, 2019. Available at https://voyager.library.uvic.ca/vwebv/holdingsInfo?bibId=4781188
- "Electrical machine drives: fundamental basics and practice", Claiton Moro Franchi, , CRC Press, 2019. Available at: https://voyager.library.uvic.ca/vwebv/holdingsInfo?bibId=4902255
- "Electric Powertrain: Energy Systems, Power Electronics and Drives for Hybrid, Electric and Fuel Cell Vehicles", John G.Hayes, John Wiley & Sons, 2017. Available at https://voyager.library.uvic.ca/vwebv/holdingsInfo?bibId=5224891

Assessment:

Assignments	**% 30**	Due Dates: Two weeks after the Assignments are posted
Final Project	**% 30**	Due Dates: April 08, 2021
Final Exam	**% 40**	Date: TBA

Important: All deadlines and schedules for this course will reference Pacific Standard Time until March 14, 2021 and then Pacific Daylight Time.

Re Assignments: There will be several assignments during the course including simulation and solving problems. The assignments will be defined in both individual and group works. The students will usually have two weeks to submit their assignment online through Brightspace. Please, note that on-time submission, legible presentation methods and methodical approach to problem solving will be considered in the grading.

Re Final Project: One of the key goals of this course is to learn and develop electric drive simulations using MATLAB/Simulink. To achieve this goal, there will be a simulation project as the final project for this course and students need to submit a report for the project. More clarifications and information for the project will be provided during the course' sessions. Please note, all students will be working on drive system models to ensure fairness. At the end, you are expected to run the simulation and describe how you achieve the results. A few questions will be asked to test your understanding of the model and your competence in MATLAB/Simulink.

Re Final Exam: Final exam will be comprehensive in nature and any topics discussed during the term can be tested. The students will need to submit their answer sheets online through Brightspace. More information will be provided during the course' sessions.

Note: Failure to pass the final exam will result in a failing grade 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://www.uvic.ca/calendar/archives/202101/undergrad/index.php#/policy/S1AAgoGuV?bc=true&bcCurrent=14%20-%20Grading&bcGroup=Undergraduate%20Academic%20Regulations&bcItemType=policies

There will be no supplemental examination for this course.

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:

- January 19, 2021 **(under review)**: Withdrawal with 100% reduction of tuition fees
- February 9, 2021 **(under review**: Withdrawal with 50% reduction of tuition fees
- February 28, 2021 **(under review)**: Last day for withdrawal (no fees returned)

Accommodation of Religious Observance:
https://www.uvic.ca/calendar/archives/202101/undergrad/index.php#/policy/r1q0gofdN?bc=true&bcCurrent=10%20-%20Accommodation%20of%20Religious%20Observance&bcItemType=policies

Policy on Inclusivity and Diversity:
Engineering: https://www.uvic.ca/engineering/about/equity/index.php
Academic Calendar:
https://www.uvic.ca/calendar/archives/202101/undergrad/index.php#/policy/HkQ0pzdAN?bc=true&bcCurrent=%20General%20University%20Policies&bcGroup=General%20University%20Policies&bcItemType=policies

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

Academic Integrity
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://www.uvic.ca/calendar/archives/202101/undergrad/index.php#/policy/Sk_0xsM_V?bc=true&bcCurrent=08%20-%20Policy%20on%20Academic%20Integrity&bcItemType=policies

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. https://www.uvic.ca/services/cal/.

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 have been prepared by the instructor and 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. 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
Web: www.uvic.ca/svp

Office of the Ombudsperson:
The Office of the 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, Website: https://uvicombudsperson.ca/