
ECE 482 – Electrical Drive Systems

Term – Spring 2019 (201901)

Instructor

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Office Hours

Days: Wednesdays, Thursdays
Time: 3:30 to 4:30 PM
Location: EOW 407

Course Objectives

Electrical drive systems are gaining popularity with every passing day. Home appliance market and the traditional industrial drives market have already accepted electrical drive systems and are reaping rich dividends. Focus on electric transportation has furthered electrical drive system's penetration in society. Consequently, it is important for a modern engineer to be familiar with the fundamentals of electrical drive systems. ECE 482 provides an ideal opportunity for you, as an upcoming engineer, to get introduced to the world of electrical drive systems. The primary objectives of the course are to:

- (a) Inform the advantages of electrical drive systems
- (b) List the components that constitute electrical drive systems
- (c) Analyze a few popular electrical drive systems

Learning Outcomes

By enrolling in ECE 482 and actively involving yourself in the learning process, you shall be able to

- (i) Define an electrical drive system
- (ii) Justify the need for electrical drive system for a given application
- (iii) List the elements that make an electrical drive system
- (iv) Analyze a few different electrical drive systems
- (v) Develop mathematical models of key components of an electrical drive system
- (vi) Compute the operating parameters and assess the performance of a drive system
- (vii) Identify the benefits and limitations of different control strategies used in electrical drives
- (viii) Simulate an electrical drive systems using MATLAB/Simulink

Syllabus

The syllabus comprises of:

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.

In order to benefit fully from the course, it is essential you have an in-depth knowledge about Electrical Machines (**pre-requisite course: ELEC 370**). Further, if you are familiar with control systems terminologies and power electronic devices & circuits, it would be a great asset.

Lecture

A-Section(s): A01 / CRN **20911**
Days: Tuesdays, Wednesdays, Fridays
Time: 12:30 PM to 1:20 PM
Location: Bob Wright Center A104

Marker TA – Praneydeep Rastogi
Email id: praney.deep.rastogi@gmail.com

Required Text

Entire course will be based on the following text book. Therefore, it is essential you have it with you.

Title: Electric Drives

Authors: Ion Boldea, S. A. Nasar

Publisher: CRC Press

Edition: 3rd Edition

References:

As a new learner of this advanced topic, you might benefit immensely by referring to these books in addition to the text book.

- 1) *Power Electronics and AC Drives* by **Bimal K. Bose**
- 2) *Power Electronics: Circuits, Devices and Applications* by **Muhammad H. Rashid**
- 3) *Electric Machines and Drives – A first course* by **Ned Mohan**
- 4) *Dynamic Simulations of electric machinery: Using MATLAB/Simulink* by **C. M. Ong**

Required Software:

In addition to utilizing the text book, we will rely on simulations using MATLAB/Simulink quite extensively to simulate the drive systems covered in the course. MATLAB simulation is a skill that is widely sought after by modern industries. Hence, you would gain by acquiring this skill.

MATLAB/Simulink, Student version (<https://matlab.engr.uvic.ca/>) is free for you all. Therefore, please install the software in your personal computer. Please install the following toolboxes in addition to MATLAB/Simulink.

- Simscape Driveline (formerly SimDriveLine)
- Simscape Electronics (formerly SimElectronics)
- Simscape Power Systems (formerly SimPowerSystems)

Assessment:

Validating one's learning is important and hence in ECE 482, 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:

In-class quizzes	5 x 2 = 10%	Tuesdays except 8-Jan, 12-Feb, 19-Feb, 2-Apr
Assignment Quizzes:	4 x 2.5 = 10%	Dates: To be announced in CourseSpace
Mid-term	1x20 = 20%	Due Date: 13-Feb-2019
MATLAB Project	1x10 = 10%	Due Date: 5-Apr-2019
Final Exam	1x50 = 50%	Date: To be announced

I have furnished more details about each of the assessment scheme in Appendix A. Please take time to read through it.

Further, as most of you would be graduating soon after completing ECE 482, I believe it is important that these assessments also help you nurture professionalism. Therefore, about 10% of marks would be allotted towards:

- (a) On-time submission
- (b) Organization & legible presentation

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/calendar2019-01/undergrad/info/regulations/grading.html>

There will be no supplemental examination for this course.

<https://web.uvic.ca/calendar2019-01/undergrad/info/regulations/exams.html#>

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

Accommodation of Religious Observance:

<https://web.uvic.ca/calendar2019-01/undergrad/info/regulations/religious-observanc.html>

Policy on Inclusivity and Diversity:

<https://web.uvic.ca/calendar2019-01/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/calendar2019-01/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 for appropriate accommodation. Alternatively, you may want to contact the Center for Accessible Learning located on campus.

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

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

Course Lecture Notes: As a first time learner of electrical drive systems, you are encouraged to study the text book and the reference books listed. Therefore, I shall refrain from providing any lecture notes. On the other hand, I shall supply you with a tentative schedule of topics I intend to discuss during lecture

hours. I recommend strongly that you spend time reading about the topic both before and after the lecture. Where ever appropriate, I might supply a few materials that would supplement the text book. 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.

Course Evaluation: Towards the end of term, as in all other courses at UVic, you will have the opportunity to complete an anonymous survey regarding your learning experience (CES). The survey is vital to providing feedback to me regarding the course and my teaching, as well as to help the department improve the overall program for students in the future. When it is time for you to complete the survey you will receive an email inviting you to do so. You will need to use your UVic Netlink ID to access the survey, which can be done on your laptop, tablet, or mobile device. I will remind you and provide you with more detailed information nearer the time but please be thinking about this important activity during the course.

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. Oral/written/email feedback are all welcome anytime during the term.

Appendix A

Assessment:

As indicated in the course outline, I suggest the following periodic assessment scheme:

In-class quizzes	5 x 2 = 10%	Tuesdays except 8-Jan, 12-Feb, 19-Feb, 2-Apr
Assignment Quizzes:	4 x 2.5 = 10%	Dates: To be announced in CourseSpace
Mid-term	1x20 = 20%	Date: 13-Feb-2019
MATLAB Project	1x10 = 10%	Due Date: 5-Apr-2019
Final Exam	1x50 = 50%	Date: To be announced

In-class quizzes:

The main objective of the quizzes is to provide instant and frequent feedback about your understanding of the course material. Key information about these quizzes are:

Day: Every Tuesday (except 8-Jan, 12-Feb, 19-Feb, 2-Apr)

Time: During lecture hour

Duration: 15 minutes

Type of questions: Multiple choice questions or descriptive type

Restrictions: No discussion with peers

Accommodations: You can refer to any resource such as notes, text book or internet

Calculator: Any type of calculator can be used

Weightage: Each quiz will have 2% weightage

I do understand that you might not be able to appear for all the quizzes. Hence, I shall consider only your best 5 performances towards the grade.

Note: These quizzes will be administered using an education software called TopHat. In order to participate in these quizzes, you need to enroll with the software. There is a small fee (about \$30 per term) to use this software. I shall be sending an invitation to each one of you before the first week of classes end.

Assignment Quizzes:

In this course, there will be 4 assignment based quizzes. Each assignment might have about 10 questions. I shall also be providing the complete solution to these questions. Each of you is expected to learn to solve these problems. The quizzes will be based on these assignment problems.

Some important information about the assignment quizzes are given below:

Quiz Dates: To be announced in CourseSpace

Duration: 45 minutes

Type of questions: Multiple choice questions and descriptive type

Restrictions: No discussion with peers, no access to text book or lecture notes or internet

Accommodations: Hand-written notes up to one single sided A4 sheet

Calculator: Any type of calculator can be used

Weightage: Each assignment quiz is worth 2.5%

Please note, I shall assign a few marks for legible and methodical presentation just to ensure you present your answers in a professional manner. In case you find any issue with the way your assignment quiz is marked, please do not hesitate to contact the TA via email.

Midterm:

Midterm exam will help you review all topics covered in the first month of the term. Some useful information about the midterm exam are given below:

Date: 13-Feb-2019

Time: During lecture hour

Duration: 45 minutes

Type of questions: Multiple choice questions and descriptive type

Restrictions: No discussion with peers, no access to text book or lecture notes or internet

Accommodations: Hand-written notes up to two single sided A4 sheets

Calculator: Any type of calculator can be used

Weightage: Midterm exam will be worth 20%

Please note, I shall assign a few marks for legible and methodical presentation just to ensure you present your answers in a professional manner.

MATLAB Project:

One of the key learning outcomes from this course is the ability to simulate electric drive systems using MATLAB/Simulink. To accomplish this learning outcome, I shall assign a take home project. I shall upload more details about this project in CourseSpace before the reading break week.

Please note, all students will be working on the same simulation model to ensure fairness. Details about assessment will be discussed during a lecture and will be shared via CourseSpace.

Final Exam:

Final exam will be comprehensive in nature i.e. any topic discussed during the term can be tested. Some key information about the final exam are given below:

Date: To be announced

Time: To be announced

Duration: 3 hours

Type of questions: Multiple choice questions and descriptive type

Restrictions: No discussion with peers, no access to text book or lecture notes or internet

Accommodations: Hand-written notes up to two single sided A4 sheets

Calculator: Any type of calculator can be used

Weightage: Final exam will be worth 50%

Please note, I shall assign a few marks for legible and methodical presentation just to ensure you present your answers in a professional manner.