

## COURSE OUTLINE

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### ECE482 Electrical Drive Systems

Term – SPRING 2020 (202001)

**Instructor**

Dr. Babak Manouchehrinia  
E-mail: bmn14@uvic.ca

**Office Hours**

Days: Tuesday  
Time: 5:30 pm to 6:30 pm  
Location: ELW A324

**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. ELEC 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 ELEC 482 and actively involving yourself in the learning process, you shall be able to

- (i) Calculate equivalent inertia for a drive system.
- (ii) Analyze fundamental torque equation of electric drive.
- (iii) Classify different loads torque.
- (iv) Understand the basis operation of variable frequency drive for speed control of an induction motor.
- (v) Analyze DC chopper circuit for speed control of DC motor.
- (vi) Analyze synchronous motor drive.

**Syllabus**

The syllabus for the course comprises of:

Elements of drive systems, characterization of mechanical loads, requirements of electrical drive systems, dynamic equations of electrical machines, dc drives with various power sources, induction motor drives, ac controller, V/F control for induction motor, 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.

A-Section(s): A01 / CRN 20934

Marker TA: Reza Arjmand

Days: Tuesdays, Thursday

Email ID: rezarjmand@yahoo.com

Course Time/location: 6:30 PM to 7:45 PM, ECS 124

Marker office Location: Carsa A153

### Textbook

Entire course will be based on the following text books:

1. Electric Drives by Ion Boldea and Syed A. Nasar. Publisher: Taylor & Francis-ebooks
2. Fundamentals of Electrical Drives, by G. K. Dubey Publisher: Alpha Science International Ltd, 2<sup>nd</sup> Edition
3. Power Electronics and AC Drives by Bimal K. Bose
4. Power Electronics: Circuits, Devices and Applications by Muhammad H. Rashid
5. Electric Machines and Drives – A first course by Ned Mohan

### Website address:

<https://www.ece.uvic.ca/~elec482/>

### Assessment:

Validating one's learning is important and hence in ELEC 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:

Quizzes in class:	2x5% = 10%	On 06-Feb-2020 & 10-Mar-2020
Mid-term:	4x19% = 76%	On 23-Jan-2020, 08-Feb-2020, 03-Mar-2020 & 17-Mar-2020
Project:	1x24% = 24%	Due Date: 23-Mar-2020
Assignments:	We will have some assignments for the course but they have no weight. It is recommended you work independently while answering assignment questions.	

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

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.

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<https://web.uvic.ca/calendar2020-01/undergrad/info/regulations/grading.html>

**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: Withdrawal with 100% reduction of tuition fees
- February 9: Withdrawal with 50% reduction of tuition fees
- February 29: Last day for withdrawal (no fees returned)

### Accommodation of Religious Observance:

<https://web.uvic.ca/calendar2020-01/undergrad/info/regulations/religious-observanc.html>

**Policy on Inclusivity and Diversity:**

<https://web.uvic.ca/calendar2020-01/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/calendar2020-01/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 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](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/>

## Appendix A

### Assessment:

Quizzes in class:	2 x 5% = 10%	On 06-Feb-2020 & 10-Mar-2020
Mid-term:	4x19% = 76%	On 23-Jan-2020, 08-Feb-2020, 03 & 17-Mar-2020
Project:	1x24% = 24%	Due Date: 23-Mar-2020
Assignments:	We will have some assignments for the course but they have no marks. It is recommended you work independently while answering assignment questions	

### In-class quizzes:

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

Time: On 06-Feb-2020 & 10-Mar-2020 during lecture hour  
Type of questions: Multiple choice questions or descriptive type  
Restrictions: No discussion with peers, no text book, no lecture notes or internet  
Calculator: Any type of calculator can be used  
Weightage: Each quiz will have 5% weightage  
Quizzes cannot be rescheduled.

### Assignments:

During the course, I will provide you a couple of assignments. These assignments have no weights but it is important to go through all assignment's problems and ensure you can solve them. The assignments have no submission deadline and I will post the solution along with assignments.

**Midterms:** Midterm exams act as final exam. These midterms will help you review all topics covered in the course step by step. Some useful information about the midterm exam are given below:

Dates: On 23-Jan-2020, 08-Feb-2020, 03-Mar-2020 & 17-Mar-2020  
Time: During lecture hour  
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 double sided A4 sheets. This sheet should only include formula and should not contain any text/explanation or any diagram/graph.  
Calculator: Any type of calculator can be used  
Weightage: Midterm exams will be worth 76%  
Midterm exams cannot be rescheduled.

Please note, at the end of the midterm exams you are expected to submit your notes along with the answer booklet. Again, I shall assign a few marks for legible and methodical presentation just to ensure you present your answers in a professional manner. In case of missing a midterm, the average marks of all midterms will be consider for the missing midterm.

### Project:

One of the key learning outcomes from this course is the ability to apply the knowledge gain in the course to the real problems in industry. To accomplish this learning outcome, I shall assign a take home project. I

shall upload more details about this project on website before the reading break week. Please note, all groups will be working on the same project to ensure fairness. To assess your performance in this project, you should present your finding as a group. During this presentation you are expected to present your solution in a professional manner. I shall be asking a few questions to test your understanding and feasibility of the solution. Project presentation will be during lecture hours between 24<sup>th</sup> March and 31<sup>st</sup> March. You do need to submit your group report for this project before March 23<sup>rd</sup> at 12:00pm. I shall be providing more details about project and report format during one of the lectures. Further, to ensure fairness, I will penalize late submissions.

Presentation Dates: between 24<sup>th</sup> March and 31<sup>st</sup> March

Time: During lecture hour

Type of questions: Group presentation.

Weightage: worth 24% of total mark. Group members will have an individual marks based on their effort and performance.