ECE 3650 – Electric Machines

**IMPORTANT NOTICE – In-Person Laboratories**

Lectures will initially be conducted via remote instruction but will return to in-person instruction the week of February 28th, 2022. All students are required to be present for in-person instruction at that time. All laboratories will be conducted in-person and will be subject to masking and social distancing requirements. Furthermore, University policy requires all students to be fully vaccinated against COVID-19 in order to attend campus and participate in this course.

**Course Objectives**

Constructional features, analysis, modeling, and applications of three-phase transformers, synchronous machines, and single phase induction motors; Principle of operation of special motors.

**Course Content**

The following topics will be covered:

- Three phase transformers:
- Synchronous machines
- Salient pole synchronous machines
- Single phase motors
- Special motors

**Textbook**


**Other Resources**


**Learning Outcomes**

1. Analyze electric circuits with three-phase transformers.
2. Develop phaser diagrams to obtain phase relationships of three-phase transformers and special transformers.
3. Analyze performance and operating limits of a grid connected synchronous machine using equivalent circuits.
4. Analyze the performance of salient pole synchronous machines using d-q theory and phasor diagrams.
5. Explain different starting methods and analyze the operating performance of single phase induction motors using equivalent circuits.

**Expected Competency Levels**

<table>
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<tr>
<th>Outcome</th>
<th>KB</th>
<th>PA</th>
<th>IN</th>
<th>DE</th>
<th>ET</th>
<th>IT</th>
<th>CS</th>
<th>PR</th>
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**Course Outline**

- **Instructor:** Shaahin Filizadeh, P.Eng.
  - SPC–309 Stanley Pauley Centre
  - (204) 480–1404
  - Shaahin.Filizadeh@umanitoba.ca
- **Office Hours:** By appointment
- **Teaching Assistant:**
  - Parisa Khodaei
  - khodaeip@myumanitoba.ca
  - Nuwan Herath Mudiyanselage
  - heratnmh@myumanitoba.ca
  - Jagannath Wijekoon
  - wiwmigis@myumanitoba.ca
- **Contact Hours:**
  - 5 credit hours
  - Lectures:
    - 3 hours x 13 weeks = 39 hours
  - Laboratorys:
    - 3 hours x 8 weeks = 24 hours
  - Tutorials
    - 3 hours x 2 weeks = 6 hours
  - Field Trip
    - 6 hours
- **Prerequisites:**
  - ECE 3720 Electric Power and Machines
- **Course Website:** http://umanitoba.ca/umlearn

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**Traditional Territories Acknowledgement**

The University of Manitoba campuses and the Department of Electrical and Computer Engineering are located on the original lands of the Anishinaabeg, Cree, Oji-Cree, Dakota, and Dene peoples, and on the homeland of the Métis Nation. We respect the Treaties that were made on these territories, we acknowledge the harms and mistakes of the past, and we dedicate ourselves to move forward in partnership with Indigenous communities in a spirit of reconciliation and collaboration.

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**Price Faculty of Engineering**

Department of Electrical and Computer Engineering

Updated: January 20, 2022
CEAB Graduate Attributes Assessed

PA.2 – Develops and/or implements a strategy to analyze complex engineering problems.

IN.4 – Understands appropriate safe work procedures during experiments or laboratory exercises.

Evaluation

The final course grade is determined by the student’s performance in laboratories, in quizzes, and on examinations. Students must complete all the laboratories in order to be eligible to receive a passing grade.

<table>
<thead>
<tr>
<th>Component</th>
<th>Value (%)</th>
<th>Method of Feedback</th>
<th>Learning Outcomes Evaluated</th>
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<td>Laboratories</td>
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<td>F, S</td>
<td>2, 3, 4, 5</td>
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<td>Final Examination</td>
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<td>S</td>
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* Method of Feedback: F - Formative (written comments and/or oral discussion), S - summative (numerical grade)

Academic Integrity

Students are expected to conduct themselves in accordance with the highest ethical standards of the Profession of Engineering and evince academic integrity in all their pursuits and activities at the university. As such, in accordance with the General Academic Regulations on Academic Integrity, students are reminded that plagiarism or any other form of cheating in examinations, term tests, assignments, projects, or laboratory reports is subject to serious academic penalty (e.g. suspension or expulsion from the faculty or university). A student found guilty of contributing to cheating by another student is also subject to serious academic penalty.

Requirements/Regulations

- Attendance at lectures and laboratories is essential for successful completion of this course. Students must satisfy each evaluation component in the course to receive a passing final grade.
- It is the responsibility of each student to contact the instructor in a timely manner if he or she is uncertain about his or her standing in the course and about his or her potential for receiving a failing grade. Students should also familiarize themselves with the University’s General Academic Regulations, as well as Section 3 of the Faculty of Engineering Academic Regulations dealing with incomplete term work, deferred examinations, attendance and withdrawal.
- No programmable devices or systems (such as calculators, PDAs, iPods, iPads, cell phones, smart watches, wireless communication or data storage devices) are allowed in examinations unless approved by the course instructor.
- Students should be aware that they have access to an extensive range of resources and support organizations. These include Academic Resources, Counselling, Advocacy and Accessibility Offices as well as documentation of key University policies e.g. Academic Integrity, Respectful Behaviour, Examinations and related matters.

Copyright Notice

All materials provided in this course are copyright and are provided under the fair dealing provision of the Canadian Copyright Act. This material may not be redistributed in any manner without the express written permission of the relevant copyright holder.

Retention of Student Work

Students are advised that copies of their work submitted in completing course requirements (i.e. assignments, laboratory reports, project reports, test papers, examination papers, etc.) may be retained by the instructor and/or the department for the purpose of student assessment and grading, and to support the ongoing accreditation of each Engineering program. This material shall be handled in accordance with the University’s Intellectual Property Policy and the
protection of privacy provisions of *The Freedom of Information and Protection of Privacy Act (Manitoba).* Students who do not wish to have their work retained must inform the Head of Department, in writing, at their earliest opportunity.

### Grading Scale

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Note: These boundaries represent a guide for the instructor and class alike. Provided that no individual student is disadvantaged, the instructor may vary any of these boundaries to ensure consistency of grading from year-to-year.