



COURSE OUTLINE

ELR232

Prepared: Robert Allen Approved: Corey Meunier

Course Code: Title	ELR232: ELECTRICAL MACHINES
Program Number: Name	4029: ELECTRICAL TY-PROCES
Department:	ELECT./INSTRUMENTATION PS
Semester/Term:	17F
Course Description:	This course is an analytical study of the characteristics, performance and control of D.C. generators and motors, single and polyphase induction motors, polyphase synchronous machines and transformers, supported by an integrated laboratory program.
Total Credits:	7
Hours/Week:	5
Total Hours:	75
Prerequisites:	ELR109
Corequisites:	ELR216
Substitutes:	ELR208
This course is a pre-requisite for:	ELR223, ELR236, ELR250, ELR311, ELR330
Vocational Learning Outcomes (VLO's): Please refer to program web page for a complete listing of program outcomes where applicable.	<p>#1. Analyze, interpret, and produce electrical and electronics drawings, technical reports including other related documents and graphics.</p> <p>#2. Analyze and solve complex technical problems related to electrical systems by applying mathematics and science principles.</p> <p>#4. Design, assemble, test, modify, maintain and commission electrical equipment and systems to fulfill requirements and specifications under the supervision of a qualified person.</p> <p>#5. Commission and troubleshoot static and rotating electrical machines and associated control systems under the supervision of a qualified person.</p> <p>#6. Design, assemble, analyze, and troubleshoot electrical and electronic circuits, components, equipment and systems under the supervision of a qualified person.</p> <p>#7. Design, install, analyze, assemble and troubleshoot control systems under the supervision of a qualified person.</p> <p>#10. Prepare reports and maintain records and documentation systems.</p> <p>#12. Apply and monitor health and safety standards and best practices to workplaces.</p>



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	<p>#13. Perform and monitor tasks in accordance with relevant legislation, policies, procedures, standards, regulations, and ethical principles.</p> <p>#16. Select and recommend electrical equipment, systems and components to fulfill the requirements and specifications under the supervision of a qualified person.</p>
<p>Essential Employability Skills (EES):</p>	<p>#1. Communicate clearly, concisely and correctly in the written, spoken, and visual form that fulfills the purpose and meets the needs of the audience.</p> <p>#2. Respond to written, spoken, or visual messages in a manner that ensures effective communication.</p> <p>#3. Execute mathematical operations accurately.</p> <p>#4. Apply a systematic approach to solve problems.</p> <p>#5. Use a variety of thinking skills to anticipate and solve problems.</p> <p>#6. Locate, select, organize, and document information using appropriate technology and information systems.</p> <p>#7. Analyze, evaluate, and apply relevant information from a variety of sources.</p> <p>#8. Show respect for the diverse opinions, values, belief systems, and contributions of others.</p> <p>#9. Interact with others in groups or teams that contribute to effective working relationships and the achievement of goals.</p> <p>#10. Manage the use of time and other resources to complete projects.</p> <p>#11. Take responsibility for ones own actions, decisions, and consequences.</p>
<p>Course Evaluation:</p>	<p>Passing Grade: 50%, D</p>
<p>Other Course Evaluation & Assessment Requirements:</p>	<p>The student must maintain a minimum 50% average in both the theory portion and lab portion of the class in order to receive a passing grade.</p> <p>Grade Definition Grade Point Equivalent A+ 90 – 100% 4.00 A 80 – 89% B 70 - 79% 3.00 C 60 - 69% 2.00 D 50 – 59% 1.00 F (Fail) 49% and below 0.00</p> <p>CR (Credit) Credit for diploma requirements has been awarded. S Satisfactory achievement in field /clinical placement or non-graded subject area. U Unsatisfactory achievement in field/clinical placement or non-graded subject area. X A temporary grade limited to situations with extenuating circumstances giving a student additional time to complete the requirements for a course. NR Grade not reported to Registrar’s office.</p>



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W Student has withdrawn from the course without academic penalty.

Evaluation Process and Grading System:

Evaluation Type	Evaluation Weight
Lab Component	30%
Tests (4)/Quizzes/Assignments	70%

Books and Required Resources:

Electrical Machines, Drives, And Power Systems by Theodore Wildi
 Publisher: Pearson Prentice Hall Edition: 6th
 ISBN: 0-13-177691-6

Course Outcomes and Learning Objectives:

Course Outcome 1.

Analyze and test direct current (dc) motors and generators.

Learning Objectives 1.

- Describe the construction of dc machines.
- Describe how a dc generator generates voltage.
- Describe how a dc motor develops torque.
- Perform calculations to determine electrical, mechanical and magnetic operating parameters of dc machines.
 - Connect and test various configurations of dc machines.

Course Outcome 2.

Analyze and test single and polyphase transformers.

Learning Objectives 2.

- Describe the construction of various power, control and instrument transformers.
- Describe the principles of operation of ideal and real transformers.
- Utilize phasor diagrams to explain the characteristics of transformers operating at various power factors.
 - Perform calculations involving power, voltage, current and flux.



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- Connect and test various configurations of single and polyphase transformers.
- Describe safety issues regarding transformers.

Course Outcome 3.

Analyze and test three phase alternating current (ac) generators.

Learning Objectives 3.

- Describe the construction of ac synchronous generators.
- Perform calculations to determine electrical, mechanical and magnetic operating parameters of ac synchronous generators.
- Utilize phasor diagrams to explain the characteristics of ac synchronous generators operating at various power factors and under various load conditions.
- Connect and test ac synchronous generators.

Course Outcome 4.

Analyze and test single and polyphase ac induction motors.

Learning Objectives 4.

- Describe the construction of three phase ac induction motors.
- Describe how a rotating magnetic field is set up in a three phase ac motor.
- Describe how torque is developed by a three phase induction motor.
- Describe the construction of various types of single phase induction motors.
- Describe how torque is developed by single phase induction motors.
- Perform calculations to determine electrical and mechanical operating parameters of ac induction motors.
- Connect and test various types of ac induction motors.

Course Outcome 5.



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Analyze and test single and polyphase ac synchronous motors.

Learning Objectives 5.

- Describe the construction of a three phase synchronous motor.
- Describe how a synchronous motor develops torque.
- Describe methods of starting synchronous motors.
- Perform calculations to determine electrical, mechanical and magnetic operating parameters of ac synchronous motors.
 - Utilize phasor diagrams to explain the characteristics of ac synchronous motors operating at various power factors and under various load conditions.
 - Describe how synchronous motors are used for power factor correction and perform related calculations.
 - Describe the construction and operation of common fractional horsepower single phase synchronous motors.

Course Outcome 6.

Construct and test various motor control circuits.

Learning Objectives 6.

- Describe power and control components of typical ac and dc motor control schemes.
- Define wiring diagram, schematic diagram, ladder logic, relay logic.
- Draw and interpret wiring, schematic, ladder logic and relay logic diagrams.
- Connect and test various motor control circuits.
- Apply rules from the Canadian Electrical Code relating to motor installation.

Date:

Friday, September 1, 2017

Please refer to the course outline addendum on the Learning Management System for further information.