



## COURSE OUTLINE: ELR820 - ELECTRICAL THEORY 3

Prepared: A. Gooderham

Approved: Corey Meunier, Chair, Technology and Skilled Trades

<b>Course Code: Title</b>	ELR820: ELECTRICAL THEORY - LEVEL 3
<b>Program Number: Name</b>	6522: CONST & MTCE ELE ADV
<b>Department:</b>	ELEC. APPRENTICES
<b>Semesters/Terms:</b>	19W
<b>Course Description:</b>	This course covers three phase alternating current circuit theory, poly-phase transformers and alternating current motors and generators.
<b>Total Credits:</b>	6
<b>Hours/Week:</b>	6
<b>Total Hours:</b>	60
<b>Prerequisites:</b>	There are no pre-requisites for this course.
<b>Corequisites:</b>	There are no co-requisites for this course.
<b>Essential Employability Skills (EES) addressed in this course:</b>	<div>EES 3    Execute mathematical operations accurately.</div> <div>EES 4    Apply a systematic approach to solve problems.</div> <div>EES 5    Use a variety of thinking skills to anticipate and solve problems.</div> <div>EES 7    Analyze, evaluate, and apply relevant information from a variety of sources.</div> <div>EES 8    Show respect for the diverse opinions, values, belief systems, and contributions of others.</div> <div>EES 9    Interact with others in groups or teams that contribute to effective working relationships and the achievement of goals.</div> <div>EES 11   Take responsibility for ones own actions, decisions, and consequences.</div>
<b>General Education Themes:</b>	Science and Technology
<b>Course Evaluation:</b>	Passing Grade: 50%, D
<b>Other Course Evaluation &amp; Assessment Requirements:</b>	<div>No Rewrites will be granted for tests attempted with unsuccessful results.</div> <div>No Final exam is provided. Block/section tests only.</div> <div>Quizzes and assignments worth a max 5% towards final grade can be given at any time.</div> <div>Grade</div> <div>Definition Grade Point Equivalent</div> <div>A+ 90 - 100% 4.00</div> <div>A 80 - 89%</div> <div>B 70 - 79% 3.00</div> <div>C 60 - 69% 2.00</div> <div>D 50 - 59% 1.00</div> <div>F (Fail) 49% and below 0.00</div> <div>CR (Credit) Credit for diploma requirements has been awarded.</div> <div>S Satisfactory achievement in field /clinical placement or non-graded subject area.</div> <div>U Unsatisfactory achievement in field/clinical placement or non-graded subject area.</div>



SAULT COLLEGE | 443 NORTHERN AVENUE | SAULT STE. MARIE, ON P6B 4J3, CANADA | 705-759-2554

	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. W Student has withdrawn from the course without academic penalty.	
<b>Books and Required Resources:</b>	Delmars Standard Textbook of Electricity by Stephen L. Herman Publisher: Nelson Edition: 5 ISBN: 978-0-17-665680-5	
<b>Course Outcomes and Learning Objectives:</b>	<b>Course Outcome 1</b>	<b>Learning Objectives for Course Outcome 1</b>
	Three-phase circuits	List the advantages of three phase circuits over single phase circuits.  State the advantage and disadvantages of three phase Wye and Delta systems.  Calculate voltage, current and power for three phase Wye and Delta systems with resistive loads.  Calculate voltage, current and power for three phase Wye and Delta systems with series and parallel RLC loads.  Calculate the changes in circuit values as a result of three phase power factor correction.  Perform calculations and show connections of wattmeters for three phase systems.  Explain the principles of and show proper connection for power-factor and phase-angle meters.
	<b>Course Outcome 2</b>	<b>Learning Objectives for Course Outcome 2</b>
	Single-phase transformers	List the various classifications of transformers and identify applications.  List losses associated with transformers and methods to reduce them.  Describe the methods employed to cool transformers.  Identify and describe safety concerns of transformer cooling mediums.  Identify and describe safety procedures for taking instrument transformers off line.  Interpret transformer nameplate data.
	<b>Course Outcome 3</b>	<b>Learning Objectives for Course Outcome 3</b>
	Three-phase transformers	Calculate voltages and currents for three phase transformers.  Calculate transformed and conducted power for autotransformers.  Perform calculations for the determination of transformer impedances.

	<p>Calculate maximum available fault currents at the secondary of a transformer.</p> <p>Describe procedures for determining transformer polarity, terminal identification, winding ratio and insulation resistance.</p> <p>Describe procedures for paralleling transformers and taking one off line.</p> <p>Describe alternator and transformer connections for various 3 phase systems.</p> <p>Explain the principles of three phase open delta connections and perform related calculations.</p>
<b>Course Outcome 4</b>	<b>Learning Objectives for Course Outcome 4</b>
Three-phase alternators	<p>Describe the theory of operation of alternators.</p> <p>Perform calculations to illustrate principles for single and 3-phase power conversion.</p> <p>Describe the methods of synchronizing alternators.</p>
<b>Course Outcome 5</b>	<b>Learning Objectives for Course Outcome 5</b>
Three-phase motors	<p>Describe the principle of operation of three phase squirrel cage induction motors.</p> <p>Describe the operating characteristics of three phase squirrel cage induction motors.</p> <p>Describe the troubleshooting procedures for three phase squirrel cage induction motors.</p> <p>Identify AC motor connections and terminal markings for multiple voltage and speed applications.</p> <p>Describe the construction of single-phase induction motors.</p> <p>Describe the principle of operation of single-phase induction motors.</p> <p>Describe the operating characteristics of single-phase induction motors.</p> <p>Describe the troubleshooting procedures for single-phase induction motors.</p> <p>Describe the construction of three-phase wound rotor induction motors.</p> <p>Describe the principle of operation of three-phase wound rotor induction motors.</p> <p>Describe the operating characteristics of three phase wound rotor induction motors.</p> <p>Describe the trouble-shooting procedures for three-phase</p>

	<p>wound rotor induction motors.</p> <p>Describe the construction of three phase synchronous motors.</p> <p>Describe the principle of operation of three phase synchronous motors.</p> <p>Describe the operating characteristics of three phase synchronous motors.</p> <p>Describe the troubleshooting procedures for three phase synchronous motors.</p> <p>Describe the operation of synchronous motors in power factor correction and constant speed applications.</p> <p>State the types of insulation classification and applications used in AC motors.</p> <p>Describe:</p> <ul style="list-style-type: none"><li>i. brush adjustments</li><li>ii. brush selection for wound rotor motors</li><li>iii. slip ring care</li><li>iv. bearing specifications and types</li><li>v. bearing applications</li><li>vi. bearing lubrication</li></ul> <p>Interpret motor name plate specification values.</p>												
<b>Evaluation Process and Grading System:</b>	<table><tr><th>Evaluation Type</th><th>Evaluation Weight</th><th>Course Outcome Assessed</th></tr><tr><td>Test1</td><td>33%</td><td></td></tr><tr><td>Test2</td><td>33%</td><td></td></tr><tr><td>Test3</td><td>34%</td><td></td></tr></table>	Evaluation Type	Evaluation Weight	Course Outcome Assessed	Test1	33%		Test2	33%		Test3	34%	
Evaluation Type	Evaluation Weight	Course Outcome Assessed											
Test1	33%												
Test2	33%												
Test3	34%												
<b>Date:</b>	September 4, 2018												
	Please refer to the course outline addendum on the Learning Management System for further information.												