COURSE OUTLINE: ELR820 - ELECTRICAL THEORY 3

Prepared: A. Gooderham, J. Paloniemi
Approved: Corey Meunier, Chair, Technology and Skilled Trades

Course Code: Title	ELR820: ELECTRICAL THEORY - LEVEL 3
Program Number: Name	6522: CONST & MTCE ELE ADV
Department:	ELEC. APPRENTICES
Semesters/Terms:	21W, 20F
Course Description:	Students will explain principles of, and perform calculations relating to, three phase alternating current circuits, poly-phase transformers and AC motors and generators.
Total Credits:	6
Hours/Week:	6
Total Hours:	60
Prerequisites:	There are no pre-requisites for this course.
Corequisites:	There are no co-requisites for this course.
Essential Employability Skills (EES) addressed in this course:	EES 3 Execute mathematical operations accurately. EES 4 Apply a systematic approach to solve problems. EES 5 Use a variety of thinking skills to anticipate and solve problems. EES 7 Analyze, evaluate, and apply relevant information from a variety of sources. EES 8 Show respect for the diverse opinions, values, belief systems, and contributions of others. EES 9 Interact with others in groups or teams that contribute to effective working relationships and the achievement of goals. EES 11 Take responsibility for ones own actions, decisions, and consequences.
Course Evaluation:	Passing Grade: 50%, D A minimum program GPA of 2.0 or higher where program specific standards exist is required for graduation.
Other Course Evaluation & Assessment Requirements:	No Rewrites will be granted for tests attempted with unsuccessful results. There is no final exam. Block/section tests only. Quizzes and assignments worth a max 5% towards final grade can be given at any time, and each will be attributed toward the percentage of the next test. 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

In response to public health requirements pertaining to the COVID19 pandemic, course delivery and assessment traditionally delivered in-class, may occur remotely either in whole or in part in the 2020-2021 academic year.

F (Fail)49% and below 0.00

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.
W Student has withdrawn from the course without academic penalty.

Books and Required Resources:

Delmars Standard Textbook of Electricity by Stephen L. Herman
Publisher: Nelson Edition: 5
ISBN: 978-0-17-665680-5

Course Outcomes and Learning Objectives:

Course Outcome 1	**Learning Objectives for Course Outcome 1**
1. Three-phase circuits	1.1 Explain the advantages of three phase circuits over single phase circuits. 1.2 Explain the advantages and disadvantages of Wye vs Delta three phase systems. 1.3 Calculate voltage, current and power for three phase Wye and Delta systems with resistive loads. 1.4 Calculate voltage, current and power for three phase Wye and Delta systems with series and parallel RLC loads. 1.5 Calculate component values required for three phase power factor correction. 1.6 Perform calculations for, and show connections of wattmeters for three phase systems. 1.7 Explain the principles of, and show proper connections for power-factor and phase-angle meters.
Course Outcome 2	**Learning Objectives for Course Outcome 2**
2. Explain principles of and perform calculations for Single-phase transformers	2.1 Describe the various classifications of transformers and identify applications. 2.2 Describe losses associated with transformers and methods to reduce them. 2.3 Describe the methods employed to cool transformers. 2.4 Describe safety concerns of transformer cooling mediums. 2.5 Explain safety procedures for taking instrument transformers off line. 2.6 Interpret transformer nameplate data.
Course Outcome 3	**Learning Objectives for Course Outcome 3**
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. Calculate maximum available fault currents at the secondary of a transformer.

	Describe procedures for determining transformer polarity, terminal identification, winding ratio and insulation resistance. Describe procedures for paralleling transformers and taking one off line. Describe alternator and transformer connections for various 3 phase systems. Explain the principles of three phase open delta connections and perform related calculations.
Course Outcome 4	**Learning Objectives for Course Outcome 4**
4. Explain principles of and perform calculations for Three-phase alternators	4.1 Describe the theory of operation of alternators. 4.2 Perform calculations to illustrate principles for single and 3-phase power conversion. 4.3 Describe the methods of synchronizing alternators.
Course Outcome 5	**Learning Objectives for Course Outcome 5**
5. Explain principles of and perform calculations for Three-phase motors	5.1 Explain the principle of operation of three phase squirrel cage induction motors. 5.2 Describe the operating characteristics of three phase squirrel cage induction motors. 5.3 Describe troubleshooting procedures for three phase squirrel cage induction motors. 5.4 Identify AC motor connections and terminal markings for multiple voltage and speed applications. 5.5 Describe the construction of single-phase induction motors. 5.6 Explain the principle of operation of single-phase induction motors. 5.7 Describe the operating characteristics of single-phase induction motors. 5.8 Describe troubleshooting procedures for single-phase induction motors. 5.9 Describe the construction of three-phase wound rotor induction motors. 5.10 Explain the principle of operation of three-phase wound rotor induction motors. 5.11 Describe the operating characteristics of three phase wound rotor induction motors. 5.12 Describe trouble-shooting procedures for three-phase wound rotor induction motors. 5.13 Describe the construction of three phase synchronous motors. 5.14 Explain the principle of operation of three phase synchronous motors. 5.15 Describe the operating characteristics of three phase synchronous motors. 5.16 Describe troubleshooting procedures for three phase synchronous motors. 5.17 Explain the operation of synchronous motors in power factor correction and constant speed applications.

	5.18 Describe the insulation classifications used in AC motors, and applications of each. 5.19 Explain: brush adjustments, brush selection for wound rotor motors, slip ring care, bearing specifications and types, bearing applications, bearing lubrication. 5.20 Interpret motor name plate specification values.

Evaluation Process and Grading System:

Evaluation Type	Evaluation Weight
Test1	33%
Test2	33%
Test3	34%

Date: August 18, 2020

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