COURSE OUTLINE: ELR824 - INSTALL.METHODS 3

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Course Code: Title	ELR824: INSTALLATION METHODS - LEVEL 3
Program Number: Name	6522: CONST & MTCE ELE ADV
Department:	ELEC. APPRENTICES
Semesters/Terms:	21W, 19W, 18W
Course Description:	This course has two separate components: PLCs and Motor Controls. PLCs: (Course outcomes 1 to 5) The student will develop an understanding of the hardware and software associated with the Allen Bradley ControlLogix 5000 family PLCs. PLC programming techniques using RSLogix 5000 software will be used to design, document and commission basic to intermediate PLC lab assignments. Motor Controls: (Course outcomes 6 to 8) This course introduces the student to three phase AC transformers, motors, loads and associated equipment. Lab exercises will provide the students with hands-on experience with typical commercial AC motor control circuit connections.
Total Credits:	8
Hours/Week:	8
Total Hours:	80
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 4 Apply a systematic approach to solve problems. EES 5 Use a variety of thinking skills to anticipate and solve problems. EES 6 Locate, select, organize, and document information using appropriate technology and information systems. 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 10 Manage the use of time and other resources to complete projects. 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 &	PLCs 50%

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.

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Assessment Requirements:	Motor Controls 50%

	Total 100%
	*The student must complete and demonstrate all labs in order to receive a passing grade for the lab demonstration portion of evaluation.
	*The student must achieve a passing grade (minimum 50%)in both the PLC portion and the Motor Controls portion in order to pass the course.
	*The student must achieve a passing grade in both lab demonstrations and lab write-ups in order to achieve a passing grade for the course.
	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
	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.
	Cell Phones turned off and put away during Practicals
	Smart Watches removed and put away during practicals
	If your Phone or Smart Watch rings during a practical a grade of zero will be issued for the exercise.

Course Outcomes and Learning Objectives:

Course Outcome 1	Learning Objectives for Course Outcome 1
Describe the function and basic operation of a PLC and understand the related terminology including numbering system.	• Describe the function of a PLC and state its applications • State the major advantages of a typical programmable logic controller(PLC) over conventional hardware relay systems • Identify the four major components of a typical PLC and describe the functions of each • Identify the two distinct types of memory • Understand decimal, binary, octal, hexadecimal, binary coded decimal (BCD) numbering systems • Perform conversions from one system to another
Course Outcome 2	**Learning Objectives for Course Outcome 2**
Understand the I/O addressing and hardwiring requirements.	• Define the term discrete and the term analog • Describe the I/O section of a PLC • Define the term interposing relay • Define the term optical isolation • Understand the concept of base and alias tags • Relate the I/O addressing to physical location

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	• Describe the proper wiring connections for input/output devices and their corresponding modules • Describe how basic AC and DC input and output modules work and create a wiring diagram
Course Outcome 3	**Learning Objectives for Course Outcome 3**
Develop and demonstrate basic programming techniques for AB ControlLogix 5000 PLC`s using RSLogix 5000 Software.	• Describe basic programming techniques • Understand the Examine ON, OFF, timers, counters, move, limit test, sequencers and internal storage instructions • Describe the Force On and Off features and hazards that could be associated with both • Program basic PLC functions offline • Program PLC`s to control • Hard-wire PLCs to field equipment and input/output cards • Create documentation to add to a PLC program
Course Outcome 4	**Learning Objectives for Course Outcome 4**
Demonstrate the ability to write basic PLC programs to control various electrical equipment in the lab and run the programs on a PLC.	• Download a program to a PLC from a remote PC over Ethernet to a particular PLC in the Lab • Edit online programs • Upload a program to a PC from a PLC • Program basic PLC functions online • Program PLCs to control motors, traffic lights • Download a program to a local PLC and run a program
Course Outcome 5	**Learning Objectives for Course Outcome 5**
Demonstrate the ability to connect PLCs to control various electrical equipment in the lab and run the programs in a PLC in the lab.	• Hard-wire PLCs to field equipment and I/O cards • Hardwire PLCs to control motors and traffic lights • Troubleshoot PLC control systems
Course Outcome 6	**Learning Objectives for Course Outcome 6**
Connect, test and analyze single phase and poly phase transformers.	• Describe and demonstrate the operation of single-phase transformer in terms of polarity, impedance and winding ratios. • Describe and demonstrate the operation of three phase transformers in wye and delta configurations. • Describe and demonstrate three phase transformer connections for RLC balanced loads. • Describe and demonstrate single and three phase autotransformers for reduced voltage motor starting
Course Outcome 7	**Learning Objectives for Course Outcome 7**
Connect, test and analyze wound rotor motors.	• Identify the mechanical parts, windings and connections for three phase wound rotor induction motors. • Describe and demonstrate the operation of a three phase wound rotor induction motor and its external control circuits.

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	Course Outcome 8	Learning Objectives for Course Outcome 8
		• Connect and describe the effects of differing resistances in the rotor circuit of a wound rotor motor under varying loads.
	Connect, test and analyze synchronous and squirrel cage motors.	• Describe and demonstrate the operation of synchronous motors in power factor correction and constant speed applications.
		• Describe and demonstrate the controller circuit for a two-speed squirrel cage motor.

Evaluation Process and Grading System:

Evaluation Type	Evaluation Weight
Motor Controls	50%
PLCs	50%

Date: August 18, 2020

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

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