

COURSE ELT2150: ELECTRONIC CONTROLS

Level: Intermediate

Theme: Robotic and Control Systems

Prerequisite: ELT2130 Magnetic Control Devices

Description: Students demonstrate the fundamentals of ladder/relay logic programming, and demonstrate how the program's logic controller system operates.

Parameters: Programmable logic controller, soldering station, hand tools and related resources.

Note: The student must have access to instruction from an individual with journeyman qualifications when projects are hardwired to main power supply and for permanent usage.

Curriculum and Assessment Standards

General Outcomes	Assessment Criteria and Conditions	Suggested Emphasis
<i>The student will:</i> <ul style="list-style-type: none">explain basic input and output hardware and fundamentals of basic programming in programmable logic controller systems	<i>Assessment of student achievement should be based on:</i> <ul style="list-style-type: none">explaining the basic input and output hardware components used with the fundamentals of basic programming as found in programmable logic controller (PLC) systems. <p><i>Assessment Tool</i> <i>ELT2150–1: Presentations/Reports:</i> <i>Programmable Controls</i></p> <p><i>Standard</i> <i>Performance rating of 2 for each applicable task</i></p>	10
<ul style="list-style-type: none">write a basic programming logic code, through real or programmed inputs on a programmable logic system, to operate and control electromagnetic devices	<ul style="list-style-type: none">writing the basic programming logic code using real or programmed inputs to operate electromagnetic devices in a programmable logic system	85

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General Outcomes	Assessment Criteria and Conditions	Suggested Emphasis
<p><i>The student will:</i></p> <ul style="list-style-type: none"> • wire, operate and test a programmable electromagnetic device • demonstrate established laboratory procedures and safe work practices • demonstrate basic competencies. 	<p><i>Assessment of student achievement should be based on:</i></p> <ul style="list-style-type: none"> • wiring the input control and output electromagnetic devices that are operated by various programming instruction codes set up in a PLC such as: <ul style="list-style-type: none"> – timing relay control of a lamp or a solenoid – two-light source relay operated circuit – single-location panic stop, key start of a power contactor – single-location start/stop of a single-phase motor – two-location start/stop of a single-phase motor – single-location forward/reverse/stop of a single-phase motor – single-location start/stop/jog of a single-phase motor. <p><i>Assessment Tool</i> <i>ELTLAB–3: Assessment Checklist: Laboratory Practice, Parts 2, 3 and 4</i></p> <p><i>Standard</i> <i>Performance rating of 2 for each applicable task</i></p> <ul style="list-style-type: none"> • observed performance in following: <ul style="list-style-type: none"> – established laboratory procedures – procedures for correct use of electrical protective devices. <p><i>Assessment Tool</i> <i>ELTPSP: Assessment Checklist: Laboratory Procedures and Safety Practices</i></p> <p><i>Standard</i> <i>Performance rating of 2 for each applicable task</i></p> <ul style="list-style-type: none"> • observations of individual effort and interpersonal interaction during the learning process. <p><i>Assessment Tool</i> <i>Basic Competencies Reference Guide and any assessment tools noted above</i></p>	<p></p> <p style="text-align: center;">5</p> <p>Integrated throughout</p>

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Concept	Specific Outcomes	Notes
Safety/Resource Management	<p><i>The student should:</i></p> <ul style="list-style-type: none"> • demonstrate safe wiring practices when wiring the inputs and output circuits • use protection devices for all circuits. 	<p>Low voltage wiring, grounding, separation of voltages, fusing.</p> <p>Live voltage projects must be activated through GFI circuit breaker.</p> <p>When instructional journeyman qualifications restrict high voltage use, projects may be done in low voltages (less than 30 volts).</p>
System Identification	<ul style="list-style-type: none"> • draw and identify the various blocks of a PLC system • describe and explain numbering systems and codes • plan PLC ladder programs and wiring diagrams of the PLC system • demonstrate the fundamentals of logic • compare relay logic control and PLC programming • identify the differences between a wired relay motor control panel and a PLC motor control panel. 	<p>Housing, addresses, wiring diagram, relay logic, ladder logic.</p> <p>Application of Boolean logic.</p>
System Application	<ul style="list-style-type: none"> • research the benefits and drawbacks of using the PLC • research where, how and why PLCs are used in industry. 	<p>Tour mill, gas plant or other industrial plants.</p>
Fundamentals	<ul style="list-style-type: none"> • demonstrate principles of electromagnetic relay output devices to control motors • demonstrate the action of switch devices as an input sensor device • explain how an AC motor is operated from a PLC. 	

COURSE ELT2150: ELECTRONIC CONTROLS (continued)

Concept	Specific Outcomes	Notes
Designing and Prototyping	<p><i>The student should:</i></p> <ul style="list-style-type: none"> • demonstrate a knowledge of PLC function by writing basic programs to operate a simple relay logic control of AC motors • design the relay logic program and construct the input and output devices so that the PLC can control electromagnetic and indicator lamps • convert relay ladder diagrams into PLC ladder programs • draw PLC ladder programs complete with wiring diagram of inputs and outputs systems. 	<p>Inputs: limit switches, sensors, push buttons. Outputs: lamps, motors relays.</p>
Fabricating/Testing	<ul style="list-style-type: none"> • build and program a multi input/output PLC control installation. 	
Careers	<ul style="list-style-type: none"> • describe where industry is making use of PLC and employment opportunities. 	Tour an industrial plant.