

COURSE ELT3160: CONTROL APPLICATIONS**Level:** Advanced**Theme:** Robotic and Control Systems**Prerequisite:** ELT2150 Electronic Controls**Description:** Students demonstrate the fundamentals of programmed controls, and demonstrate how sensing devices are integrated to control output devices.**Parameters:** Program Logic Controller, associated input/output devices and related resources.
Note: The student must have access to instruction from an individual with Electrical Technologist or journeyman status when students are performing practical components other than low voltage.**Supporting Courses:** ELT2130 Magnetic Control Devices
ELT3140 Motors**Curriculum and Assessment Standards**

General Outcomes	Assessment Criteria and Conditions	Suggested Emphasis
<p><i>The student will:</i></p> <ul style="list-style-type: none"> identify and describe input and output hardware components and the methods of programming 	<p><i>Assessment of student achievement should be based on:</i></p> <ul style="list-style-type: none"> identifying and describing two types of input devices, digital and analog input hardware components and explaining how each is used in a program explaining advance programming functions such as: <ul style="list-style-type: none"> timers and counters data manipulation instructions shift register and sequencer instruction and explain how each is used in programming a programmer logic controller (PLC). <p><i>Assessment Tool</i> <i>ELTLAB-2: Assessment Checklist: Laboratory Practice, Part 1</i></p> <p><i>Standard</i> <i>Performance rating of 3 for each applicable task</i></p>	20
<ul style="list-style-type: none"> use programming logic, including real or programmed inputs, to control electromagnetic devices 	<ul style="list-style-type: none"> drawing, identifying and writing a housing address, ladder logic and wiring diagram 	60

COURSE ELT3160: CONTROL APPLICATIONS (continued)

General Outcomes	Assessment Criteria and Conditions	Suggested Emphasis
<p><i>The student will:</i></p> <ul style="list-style-type: none"> • use various instruction codes to operate and control electromagnetic devices • 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"> • fabricating, constructing and testing programmed logic to operate and control electromagnetic devices connected to a PLC. <p><i>Assessment Tool</i> <i>ELTLAB–3: Assessment Checklist: Laboratory Practice, Part 2</i></p> <p><i>Standard</i> <i>Performance rating of 3 for each applicable task</i></p> <ul style="list-style-type: none"> • changing instructional codes of input devices that the logic program uses to operate and control the electromagnetic devices connected to the PLC. <p><i>Assessment Tool</i> <i>ELTLAB–3: Assessment Checklist: Laboratory Practice, Parts 2 and 3</i></p> <p><i>Standard</i> <i>Performance rating of 3 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 – correct use of protection devices for circuits. <p><i>Assessment Tool</i> <i>ELTPSP: Assessment Checklist: Laboratory Procedures and Safety Practices</i></p> <p><i>Standard</i> <i>Performance rating of 3 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>15</p> <p>5</p> <p>Integrated throughout</p>

COURSE ELT3160: CONTROL APPLICATIONS (continued)

Concept	Specific Outcomes	Notes
Safety/Resource Management	<p><i>The student should:</i></p> <ul style="list-style-type: none"> • identify and follow safe wiring practices when wiring the input 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>
Fundamentals	<ul style="list-style-type: none"> • draw and identify addressing, ladder logic and wiring diagram of a PLC installation • describe and explain numbering systems and codes for internal logic control • plan PLC ladder programs and wiring diagrams, advance programming logic functions • create flow diagram to write programming logic • compare relay logic and PLC programming • demonstrate principles of electromagnetic motor starters to control large current flow to output devices • demonstrate principles of feedback loop input sensors to protect outputs devices • demonstrate the action of overload and limit switch feedback loop input sensors to protect the output system • demonstrate knowledge of how either a DC or an AC motor is operated by a PLC • demonstrate knowledge on how A/D conversions are done on a PLC. 	
System Identification	<ul style="list-style-type: none"> • identify the difference between real-world devices and internal program devices when programming the PLC. 	

COURSE ELT3160: CONTROL APPLICATIONS (continued)

Concept	Specific Outcomes	Notes
Real-world Applications	<p><i>The student should:</i></p> <ul style="list-style-type: none"> • research the benefits and drawbacks of using PLCs • research how PLCs are used in computer integrated manufacturing. 	
Fabricating/Testing	<ul style="list-style-type: none"> • build a multiple motor, PLC-controlled installation, and write a program to control the installation. 	Low voltage hobby motors.
Design/Prototyping	<ul style="list-style-type: none"> • demonstrate a knowledge of PLC function by writing advance programs to operate a relay controlled AC motors • design programming functions with input and output devices so the PLC can control electromagnetic devices and indicator lamps • draw PLC ladder programs complete with wiring diagrams of input and output systems. 	
Careers	<ul style="list-style-type: none"> • write a report on industries that use PLCs to control and monitor computer integrated manufacturing. 	