

COURSE ELT3030: POWER SYSTEMS & SERVICES**Level:** Advanced**Theme:** Power Systems**Prerequisite:** ELT2030 Branch Circuit Wiring**Description:** Students construct, operate, analyze and evaluate various single-phase and three-phase power systems and services.**Parameters:** Three-phase power supply, three-phase panel, transformers, wattmeter, multimeter, AC current meter, knife switches, fused safety disconnect switch, volt-amp clamp or probe 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 voltages**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"> follow established, safe laboratory procedures and practices when working with three-phase systems 	<p><i>Assessment of student achievement should be based on:</i></p> <ul style="list-style-type: none"> observed performance in following: <ul style="list-style-type: none"> established laboratory procedures using proper levels of circuit protection. <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>	5
<ul style="list-style-type: none"> construct and analyze a three-wire, single-phase electrical system 	<ul style="list-style-type: none"> constructing, analyzing and evaluating a three-wire Edison system. <p><i>Assessment Tool</i> <i>ELTLAB-1: Laboratory Practice, Part 3</i></p> <p><i>Standard</i> <i>Performance rating of 3 for each applicable task</i></p>	25

COURSE ELT3030: POWER SYSTEMS & SERVICES (continued)

General Outcomes	Assessment Criteria and Conditions	Suggested Emphasis
<p><i>The student will:</i></p> <ul style="list-style-type: none"> • analyze common reluctance inductance (RLC) vector diagrams • construct and analyze three-wire, three-phase and four-wire, three-phase wye systems • construct and analyze three-wire, three-phase delta systems • create a profile of a trade or occupation within the field of power systems and services 	<p><i>Assessment of student achievement should be based on:</i></p> <ul style="list-style-type: none"> • explaining the operating principles of the following voltage and current vector diagrams: <ul style="list-style-type: none"> – resistive circuit – inductive reactive circuit – capacitive reactive circuit – inductive and capacitive circuit – resistor inductor capacitor circuit – line voltage in a wye and delta system. <p><i>Assessment Tool</i> <i>ELTLAB–1: Laboratory Practice, Parts 1 and 2</i></p> <p><i>Standard</i> <i>Performance rating of 3 for each applicable task</i></p> <ul style="list-style-type: none"> • constructing, analyzing and evaluating various three-wire and four-wire three-phase systems such as: <ul style="list-style-type: none"> – three-phase, three-wire wye system – three-phase, four-wire wye system. <p><i>Assessment Tool</i> <i>ELTLAB–2: 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"> • constructing, analyzing and evaluating various three-wire and four-wire three-phase systems such as: <ul style="list-style-type: none"> – three-phase, three-wire delta system – three-phase, four-wire delta system. <p><i>Assessment Tool</i> <i>ELTLAB–2: 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"> • completing a career profile of a trade or occupation within the field of electrical power systems and services. <p><i>Assessment Tool</i> <i>ELTCPC: Assessment Guide: Career Profiles</i></p> <p><i>Standard</i> <i>Completing all sections of profile chart</i></p>	<p>15</p> <p>25</p> <p>25</p> <p>5</p>

COURSE ELT3030: POWER SYSTEMS & SERVICES (continued)

General Outcomes	Assessment Criteria and Conditions	Suggested Emphasis
<p><i>The student will:</i></p> <ul style="list-style-type: none"> demonstrate basic competencies. 	<p><i>Assessment of student achievement should be based on:</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>Integrated throughout</p>

Concept	Specific Outcomes	Notes
Safety/Resource Management	<p><i>The student should:</i></p> <ul style="list-style-type: none"> demonstrate safe practices in all activities, observing lockout and tagout procedures. 	<p>Individual fuses (e.g., five amps for each laboratory set-up). Live voltage projects must be activated through GFI circuit breaker. 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"> analyze single-phase three-wire systems for voltages and currents identify and diagram wye and delta systems. 	<p>Use a scientific calculator.</p>
Applied Mathematics	<ul style="list-style-type: none"> mathematically analyze three-phase three-wire delta and three-phase three-wire wye systems for line and phase voltage and currents mathematically analyze three-phase four-wire wye systems for neutral currents energize various three-phase wye and delta circuits; measure line, phase voltages and currents solve phasor diagrams using trigonometry develop and use three-phase power formula energize various three-phase wye and delta circuits; calculate and measure three-phase power consumed. 	<p>Use a scientific calculator.</p>

COURSE ELT3030: POWER SYSTEMS & SERVICES (continued)

Concept	Specific Outcomes	Notes
Testing	<p><i>The student should:</i></p> <ul style="list-style-type: none"> • diagram two-meter and three-meter wattmeter connections to measure three-phase power • diagram current transformer connections. 	Keep currents as low as possible
Real-world Applications	<ul style="list-style-type: none"> • diagram and construct a mock-up of a house service, according to Canadian Electrical Code (CEC) • diagram and construct a mock-up of a three-phase service, according to CEC • evaluate three-phase three- and four-wire data systems. 	
Careers	<ul style="list-style-type: none"> • explore areas where certification as an electrician is required. 	Electrician, power electrician, lineman, elevator electrician, communication electrician.