COURSE ELT2080:	**CONTROL SYSTEMS 2**
Level:	Intermediate
Theme:	Computer Logic Systems
Prerequisite:	ELT1080 Control Systems 1
Description:	Students demonstrate how process control technology is used in real-world applications.
Parameters:	Power supply, oscilloscope, transistor checker, breadboards, frequency counter, digital multimeter and related resources.

Curriculum and Assessment Standards

General Outcomes	Assessment Criteria and Conditions	Suggested Emphasis
The student will: • identify discrete components used in process control	*Assessment of student achievement should be based on:* • identifying the following discrete components using computer simulation, computer-assisted instruction (CAI) package or actual components: – rectifiers – silicon controlled rectifier (SCR) – transistors – junction transistor – tricode, alternating current (TRIAC) – diode, alternating current (DIAC) – field effect transistor (FET) – junction field effect transistor (JFET) – metal-oxide semiconductor field effect transistor (MOSFET) – timers (555 ICs) – OP amps (741 ICs) – solid-state relays. *Assessment Tool* *ELT2080–1: Presentations/Reports: Process Controls* *Standard* *Performance rating of 2 for each applicable task*	20

COURSE ELT2080: CONTROL SYSTEMS 2 (continued)

General Outcomes	Assessment Criteria and Conditions	Suggested Emphasis
The student will:	*Assessment of student achievement should be based on:*	
• identify and describe analog and sensor components used in process control	• explaining the following analog and sensor components used in process control: – thermistor – pressure sensor – photoelectric transducers – hall effect – opto couplers – bar codes – light controlled resistors – light emitting diode (LED) – photodiode – phototransistor – proximity switches using computer simulation, experimental boards, CAI package or actual devices. *Assessment Tool* *ELT2080–1: Presentations/Reports: Process Controls* *Standard* *Performance rating of 2 for each applicable task*	20
• construct a process control device, using analog and sensor components	• construction of a process control project, using the appropriate components. *Assessment Tool* *ELTLAB–1: Laboratory Practice, Part 3* *Standard* *Performance rating of 2 for each applicable task*	55
• demonstrate established laboratory procedures and safe work practices	• observed performance in following: – established laboratory procedures – correct procedures when working with high voltage including capacitor discharges. *Assessment Tool* *ELTPSP: Assessment Checklist: Laboratory Procedures and Safety Practices* *Standard* *Performance rating of 2 for each applicable task*	5

COURSE ELT2080: CONTROL SYSTEMS 2 (continued)

General Outcomes	Assessment Criteria and Conditions	Suggested Emphasis
The student will: • demonstrate basic competencies.	*Assessment of student achievement should be based on:* • observations of individual effort and interpersonal interaction during the learning process. *Assessment Tool* *Basic Competencies Reference Guide and any assessment tools noted above*	Integrated throughout

Concept	Specific Outcomes	Notes
Safety/Resource Management	*The student should:* • describe hazards associated with voltage (including capacitor discharge), currents, grounded systems, floating systems and isolated systems.	.
Fundamentals	• relate schematic diagrams and connection symbols to real-world devices • explain the differences among the following circuit conditions: – grounded system – floating system – isolated system.	
Applied Mathematics	• explain the voltage, current and resistance differences among series, parallel and series parallel circuits, using OHM's Law • explain differences between AC and DC as they related to semi-conductor components.	Practise mathematics skills to calculate resistance, voltage and current values.
Testing	• demonstrate correct use and procedure in operating an oscilloscope • describe an analog signal through both open and closed-loop control systems.	

Concept	Specific Outcomes	Notes
System Identification	*The student should:* • explain, experiment with and demonstrate knowledge of various semi-conductor components by prototyping *mini* control circuits in various applications, such as: – rectifiers – SCR – transistors – uni-junction transistor – TRIAC – DIAC – FET – JFET – MOSFET – timers (e.g., 555s) – operational amplifiers – solid-state relays • explain, experiment and demonstrate various semi-conductor transducers and sensors, such as: – thermistor – pressure sensor – photoelectric transducers – hall effect – opto couplers – bar codes – light controller resistors – LED – photodiode – phototransistor – proximity switches.	Temperature control circuits. Light control circuits. Fluid level control circuits, etc. Students may explain, experiment and demonstrate knowledge by breadboarding circuit projects, or using various software programs and trainers. Resource: *Electronics for Industrial Electricians*. Any number of methods may be used by the student to demonstrate knowledge, e.g., breadboarding circuits with various sensors, projects, software programs and trainers.
Real-world Applications	• research applications of solid-state control circuits in automotive, home and industrial application systems.	

COURSE ELT2080: CONTROL SYSTEMS 2 (continued)

Concept	Specific Outcomes	Notes
Fabrication/ Troubleshooting	*The student should:* • construct an electronic project(s) to control home environment or vehicle function: – troubleshoot the project – write a technical report describing the control system operation – develop flow chart and block diagram to show process control in project(s).	E.g., *Electronic Projects to Control Your Home* (Dalton T. Horn). Project could link with ELT2010 Electro-assembly 2 Project could be for car, car alarms, light indicators, fluid level indicators. Home projects could be electronic thermometer, smart thermostat, radiation monitor, automated ventilator, humidifier controller, electronic pest repeller.
	• demonstrate knowledge of testing semi-conductor components such as: – transducers and sensors – use components, transducers and sensors listed above using multimeters, oscilloscopes, solid-state testers.	Signature analysis.
Careers	• research careers primarily in control system environments • list post-secondary institutions that provide control system training.	Collect sample work for portfolio.