COURSE ELT2080: CONTROL SYSTEMS 2

Level: Intermediate

Prerequisite: ELT1080: Control Systems 1

Description: Students demonstrate how process control technology is used in real-world
applications.

Parameters: Access to a power supply, an oscilloscope, a transistor checker, breadboards, a
frequency counter, a digital multimeter and related resources.

Outcomes: The student will:

1. identify discrete components used in process control
  1.1 relate schematic diagrams and connection symbols to real-world devices
  1.2 explain differences between alternating current (AC) and direct current (DC) as they relate to
semiconductor components
  1.3 explain the differences among the following circuit conditions:
     1.3.1 grounded system
     1.3.2 floating system
     1.3.3 isolated system
  1.4 explain the voltage, current and resistance differences among series, parallel and series parallel
circuits, using Ohm's law
2. identify and describe analog and sensor components used in process control
  2.1 describe an analog signal through both open- and closed-loop control systems
  2.2 research applications of solid-state control circuits in automotive, home and industrial
application systems
3. construct a process control device, using analog and sensor components
  3.1 explain, experiment with and demonstrate knowledge of various semiconductor components by
prototyping mini control circuits in various applications including:
     3.1.1 rectifiers
     3.1.2 silicon controlled rectifier transistors
     3.1.3 unijunction transistors
     3.1.4 triac
     3.1.5 diac
     3.1.6 field-effect transistors
     3.1.7 junction field-effect transistors
     3.1.8 metal-oxide-semiconductor field-effect transistors
     3.1.9 timers; e.g., 555s
     3.1.10 operational amplifiers
     3.1.11 solid-state relays
  3.2 explain, experiment with and demonstrate various semiconductor transducers and sensors
including:
     3.2.1 thermistor
     3.2.2 pressure sensor
     3.2.3 photoelectric transducers
     3.2.4 hall effect
     3.2.5 optocouplers

   3.2.6 bar codes
   3.2.7 light controller resistors
   3.2.8 light-emitting diode
   3.2.9 photodiode
   3.2.10 phototransistor
   3.2.11 proximity switches
  3.3 construct an electronic project(s) to control home environment or vehicle function by:
   3.3.1 troubleshooting the project
   3.3.2 writing a technical report describing the control system operation
   3.3.3 developing a flow chart and block diagram to show process control in project(s)
  3.4 demonstrate correct use and procedure in operating an oscilloscope
  3.5 demonstrate knowledge of testing semiconductor components including transducers and sensors, multimeters, oscilloscopes, solid-state testers

4. demonstrate established laboratory procedures and safe work practices
  4.1 describe hazards associated with voltage, including capacitor discharge, currents, grounded systems, floating systems and isolated systems

5. demonstrate basic competencies
  5.1 demonstrate fundamental skills to:
   5.1.1 communicate
   5.1.2 manage information
   5.1.3 use numbers
   5.1.4 think and solve problems
  5.2 demonstrate personal management skills to:
   5.2.1 demonstrate positive attitudes and behaviours
   5.2.2 be responsible
   5.2.3 be adaptable
   5.2.4 learn continuously
   5.2.5 work safely
  5.3 demonstrate teamwork skills to:
   5.3.1 work with others
   5.3.2 participate in projects and tasks

6. identify possible life roles related to the skills and content of this cluster
  6.1 recognize and then analyze the opportunities and barriers in the immediate environment
  6.2 identify potential resources to minimize barriers and maximize opportunities