Revised: Summer 2024

Virginia Western Community College
ETR 237
Industrial Electronics I

Prerequisites

MTH 111 (Not Intended for Transfer) -Provides a foundation in mathematics with emphasis in arithmetic, unit conversion, basic algebra, geometry and trigonometry. This course is intended for CTE programs.

ETR 113-Studies DC and AC circuits, basic electrical components, instruments, network theorems, and techniques used to predict, analyze and measure electrical quantities.

Corequisites

MTH 131- Teaches Newton's laws, resultants and equilibrium of force systems, trusses and frames, determination of centroids, and distributed loads and moments of inertia. Introduces dry friction and force systems in space.

Course Description

This course is an introduction to modern day industrial instrumentation and process control for engineers and technicians working in the field of instrumentation and process control. This course should adequately prepare a prospective technician or serve as an introduction for a prospective engineer wishing to get a solid understanding of instrumentation and process control. Material to be covered will be all aspects of industrial instrumentation, such as sensing a wide range of variables, the transmission and recording of the sensed signal, controllers for signal evaluation, and the control of the manufacturing process for a quality and uniform product. Study areas include linear integrated circuits for industrial applications, motors, industrial control devices, power control circuits, transducers, industrial process control, and sequential process control.

Semester Credits: 4 Lecture Hours: 3 Lab Hours: 2

Required Materials

Textbook:
OER text will be used and supplemented with instructor prepared material

Software:
National Instruments MultiSim (all software available in the VWCC Computer Labs). Free access to the software will be provided by the school

Other Required Materials:

None

Course Outcomes

At the completion of this course, successful students will be able to

- Define an industrial control loop and show examples in industrial applications.
- Compare and contrast analog and digital systems and signals.
- Define, analyze, simulate, and test analog electrical components such as the diode, transistor, op-amp and thyristor.
- Read and interpret analog component datasheets.
- Draw the schematic for an AC to DC power supply and explain its operation.
- Build, test and analyze a DC power supply.
- Compare and contrast bipolar and field-effect transistors.
- Describe and analyze the model for an npn transistor and a MOS field effect transistor in switching and amplifier circuit applications.
- Build, test and analyze various transistor-based circuits.
- Describe, analyze, and test circuit applications based on the operational amplifier.
- Define the operation of analog sensors for measuring pressure, flow, temperature, humidity, water level, viscosity or pH in process control.
- Analyze and test an analog process control circuit or system.
- Explain the fundamentals and applications of soldering, integrated circuit manufacturing, and printed circuit board construction and assembly.
- Demonstrate soldering of through board components onto a printed circuit board

Topical Description

- Semiconductors
- Integrated Circuits
- Diodes
- Power Supplies
- Bipolar Transistors
- FET Transistors
- Amplifiers
- Signal Conditioning
- Operational Amplifiers
- Op-amp circuits
- Op-amp response
- Load Lines
- Filter response
- Digital to Analog Conversion
- Analog to Digital Conversion

- Thermistors
- Strain Gauges
- Thermocouple
- Wheatstone Bridge
- Thyristors
- Hysteresis
- Soldering
- Open Loop and Closed Control Circuits
- Closed Loop Heating Circuit
- Applications of Analog Circuits

Notes to Instructors

Beginning Fall 2020, VWCC will require students to have a computer or reliable access to a computer, capable of participation in an online format. Online courses at Virginia Western require a significant amount of interaction with Canvas, the Learning Management System, and many require real-time class sessions using the Zoom web-conferencing tool. To be successful in online classes, students must have substantial access to a computer with hi-speed internet connectivity. The expected requirements are listed on the college webpage.

Multisim software is provided on lab laptops. Multisim may allow an appended version for free student downloads.

ADA Statement (PDF)
Title IX Statement (PDF)