

ELECTRONICS, ROBOTICS & DRONES TECHNOLOGY (ERD)

ERD 110 Fundamentals of Electronics

4 Class Hours, 2 Lab Hours, 5 Quarter Credit Hours

An investigation of the operation of basic electrical circuits. Students will learn the makeup of the fundamental building blocks that comprise all electronic circuits, how to analyze, measure and troubleshoot these integral system concepts. Topics covered include: electron theory; conductors and insulators; Ohm's law (the relationship of current, resistance, and voltage), power; the principles of series, parallel, capacitive, and inductive circuits. Relays and Solenoids will be introduced. In the lab portion of the course, students will learn to use the necessary test equipment, used in industry, for circuit analysis.

ERD 111 Electronic Circuit Construction

3 Class Hours, 2 Lab Hours, 4 Quarter Credit Hours

Prerequisites: ERD 110

This course is an introduction to the use of the basic electronic test equipment used in industry, including power supplies, digital multimeters, function generators, and oscilloscopes. Students will learn how to solder using proper techniques and methods and soldering will include PC board through-hole soldering and surface mount devices (SMD). Other topics include AC sources, safety, fabrication of electronic connection cables, and troubleshooting concepts. Students will fabricate and test a PC board-based project. Computer-aided circuit simulation is introduced.

ERD 115 Computer and Networking Fundamentals for Engineering

3 Class Hours, 2 Lab Hours, 4 Quarter Credit Hours

This course provides a technical overview of computer hardware and computer networking used in business and engineering. Hands-on exercises are provided to give students experience with basic computer hardware fundamentals including I/O peripherals, computer processors, storage, memory and network electronics. The content serves as a technical foundation for later courses in the ERDA and ELTB programs. Upon completion of this course, students should be able to demonstrate the following computer concepts; fundamental functions and operations of the computer, identification of hardware components, basic computer operations, expansion cards, computer ports, driver installation, network terminology and protocols, local-area networks, wide-area networks, OSI model, cabling and topologies, router basics, Ethernet, IP addressing, and network standards.

ERD 120 Digital Concepts

4 Class Hours, 2 Lab Hours, 5 Quarter Credit Hours

Prerequisites: (ERD 110 and ERD 111) and (MA 110 or MA 105)

Students begin with the four fundamental number/character formatting and manipulating schemes used in digital technology: Binary, Hex, BCD, ASCII. Digital Gates along with other digital building blocks such as Tri-State Buffers, MUXes/DeMUXes, Mono, Bi, A-stable devices, and Shift-registers will be covered. Basic transistor theory and interfacing of digital devices via BJT, MOSFET, JFET, IGBT transistors will bridge logic devices to real-world systems. Logic-Levels, and Digital Wave-forms as they pertain to digital systems will be examined. Schematic Capture and Simulation software (NI MultiSim) will be used to draw and simulate digital circuits of varying levels of complexity. Logic Truth-Table expressions will be examined for potential simplification via Boolean Algebra. Throughout the course, students will have the opportunity to hone their digital knowledge skills by building, testing and troubleshooting digital circuitry.

ERD 122 Introduction to Robotic Control Systems

3 Class Hours, 2 Lab Hours, 4 Quarter Credit Hours

Prerequisites: ERD 110 or WEL 260

Students will be introduced to a range of robotic concepts including autonomy, biomimicry, and human-sense electronic-counterparts. Both Rotary and Linear Motion will be examined via DC, Servo, and Stepper motor basics along with Absolute and Incremental position feedback encoding. Mechanical drive fundamentals will accompany the topics on motion. An emphasis in graphical-based programming will allow students to develop their criticalthinking and planning skills as they create solution strategies to achieve a variety of robotic control objectives.

ERD 131 Advanced Circuits and Semiconductors

4 Class Hours, 2 Lab Hours, 5 Quarter Credit Hours

Prerequisites: MA 125 and ERD 110 and ERD 111

In this course, students will be exposed to the advanced circuits that are common to almost all and every electronic system. Students will learn the makeup of these circuits, how to analyze, measure and troubleshoot these integral system concepts. The course material will be enhanced by filter design, utilizing Computer Circuit Simulation Software and by the constructing, soldering and testing of a power supply kit. Topics will include: decibels, high, low and band pass filters, semiconductor theory, rectifiers and regulators and power supplies.

ERD 210 Introduction to Drone/UAV Technology

1 Class Hours, 2 Lab Hours, 2 Quarter Credit Hours

This course is an introduction to the evolving field of unmanned aerial vehicles (UAVs), commonly known as drones, and referred to as a remotely piloted aircraft (RPA). Topics will include drone aerodynamics, mechanical and electrical/electronic systems. This course will discuss and demonstrate GPS integrated (autonomous and remote controlled) videography, still photography, data collection and FPV (First Person Video).

ERD 212 Microprocessor Control Systems

3 Class Hours, 2 Lab Hours, 4 Quarter Credit Hours

The concepts of how a microcontroller processes and stores data will be studied. The interfacing and control are presented from a hardware and software view. Computer to peripheral interfacing and troubleshooting is emphasized. Students will study C language programming of the 8051 Core Processor to control several systems.

ERD 242 Electro-Mechanical Systems & Industrial Controls

3 Class Hours, 2 Lab Hours, 4 Quarter Credit Hours

Prerequisites: ERD 110 and MA 125

Industrial concepts of motor control and sensing are the focus of this course. Students will explore the necessary requirements for understanding and implementing Industrial Control Systems. Topics will include three phase AC power, AC / DC motors and their motor controllers including Variable Frequency AC Drives. The concepts of relay control systems and their methods of control will be examined and implemented. The course will also include industrial sensing devices such as inductive, capacitive, photoelectric and ultrasonic proximity sensing technologies and how they are installed and implemented in industrial control applications. Motor control sensors such as digital encoders will also be reinforced an applied in industrial applications.

ERD 246 Data Acquisition Systems

3 Class Hours, 2 Lab Hours, 4 Quarter Credit Hours

Prerequisites: MA 125 and ERD 110

This course is designed to introduce students to the transducers, sensors and circuits used in industry for controlling a manufacturing process. Topics of study will include Amplifier configurations, (Op-Amps), Analog and Digital Conversion (ADC/DAC), Sensors and Computer Data Acquisition (DAQ). Sensors to be studied will include: Thermal, proximity, position, pressure and motion. The course will utilize an Arduino Micro-controller for data acquisition. Students will modify the Arduino programs to meet various given criteria.

ERD 250 Data Communications and the Internet of Things (IoT)

3 Class Hours, 2 Lab Hours, 4 Quarter Credit Hours

Prerequisites: ERD 115

This course will introduce students to data communications, computer networking and the Internet of Things. Students will learn the concepts and requirements of computer networking and how the Internet of Things can provide an enormous amount of data in our connected world that can be used in a myriad of ways. Other topics include network hardware, issues in data communication, multiplexing, modulation techniques and error detection. Students will use the Raspberry Pi micro-computer with Linux and various programming languages like Python to collect data and use services such as SMS Texting, Dropbox, Gmail and Thing Speak for data notifications and visualizations.