ELECTRONICS TECHNOLOGY (ELEC)

ELEC A100   **3 Units (54 lecture hours)**
Electronic Problem Solving
Grading Mode: Standard Letter
Transfer Credit: CSU.
This course is an introductory course for students who want to learn the fundamentals of electricity and college level math. This course will cover the fundamentals of electricity and electronic circuits. Students will learn how to use math to answer questions about electricity. Students will identify electronic components and basic circuits. Students will be introduced to electronic schematics, Ohm's Law, Kirchhoff's Laws and the concepts of resistance, capacitance, and inductance. The course will cover metric prefixes, unit conversions, number systems, and binary logic.

ELEC A102   **1 Unit (9 lecture hours; 27 lab hours)**
Safety, Maintenance, and Calibration
Grading Mode: Standard Letter
Transfer Credit: CSU.
Students will learn the fundamentals to safely work with high energy systems in accordance with NFPA 70e standards. This course explores the safety standards adopted and established by the NFPA and OSHA. Students will acquire hands-on experience using multimeters and oscilloscopes to safely diagnose electrical problems. This course covers the foundational concepts of calibration in electronic test equipment. Formerly known as ELEC A170.

ELEC A103   **3 Units (36 lecture hours; 54 lab hours)**
Computer Hardware Configuration & Diagnostics
Grading Mode: Standard Letter
Transfer Credit: CSU.
This course covers computer design, components, and assembly. Students will learn to assemble working computers, install an operating system, find and install drivers, and connect the computers to the internet. Students will learn to install and troubleshoot both Windows and Linux operating systems. This course will also cover troubleshooting of common hardware, operating system, and software issues as well as recovery of data from non-functional computers. Finally, students will learn to image computers for quick recovery in the event of corruption.

ELEC A111   **3 Units (36 lecture hours; 54 lab hours)**
D.C. Circuits
Grading Mode: Standard Letter
Transfer Credit: CSU.
D.C. Circuits is an in-depth study of Direct Current (DC) electronic circuits. Students will learn how to interpret and create electrical schematics. Topics of study include Ohm's Law, Kirchhoff's Laws, resistance, capacitance, and inductance. Students will gain hands-on experience with wiring to include soldering, crimping, and heat shrinking. In the lab, students will learn how to use multimeters, power supplies, and oscilloscopes to build and analyze common DC Circuits. The lab work will focus on validating theoretical calculations by building circuits and testing them for expected performance.

ELEC A112   **3 Units (36 lecture hours; 54 lab hours)**
A.C. Circuits
Advisory: ELEC A111.
Grading Mode: Standard Letter
Transfer Credit: CSU.
An in depth study of Alternating Current (AC) electrical circuits. This course of study focuses on the math describing AC circuits, specifically the relationship between impedance, resistance, and reactance. Students will use these concepts to anticipate power factor and learn how to mitigate large inductive loads. Students will design, analyze, build, and test RLC circuits, inductance motor drivers, and filter circuits for audio signals. The lab work will focus on validating theoretical calculations by building circuits and testing them for expected performance.

ELEC A121   **3 Units (36 lecture hours; 54 lab hours)**
Robotics 1- Mechanics & Design
Advisory: ELEC A100 or concurrent enrollment.
Grading Mode: Standard Letter, Pass/No Pass
Transfer Credit: CSU.
This course covers robotic systems, engineering design, and mechanics. Students will learn to use the engineering design process to define a problem to be solved, establish requirements and specifications, and brainstorm solutions. During Lab, students will build robotic mechanisms, assemble robots according to instructions, and learn to solder. The course culminates with students prototyping the mechanical mechanisms for a robot of their design. Formerly known as ELEC A101. Graded or Pass/No Pass option.

ELEC A122   **3 Units (36 lecture hours; 54 lab hours)**
Robotics 2- Sensors, Control Theory, and Programming
Advisory: ELEC A121.
Grading Mode: Standard Letter
Transfer Credit: CSU.
This course covers many sensors used by robots to sense the environment. Sensors include limit switches, photo eyes, ultrasonic time of flight distance sensors, shaft encoders, and potentiometers. Includes a study of electronic speed controllers, servos, and stepper motors. Students will study the basics of control theory and program a closed loop speed controller (cruise control) using PID control implemented in C. Finally, students will continue their mechanical prototype developed in Robotics 1 by adding a digital control system, sensors, and autonomous code to complete their prototype.

ELEC A131   **4 Units (54 lecture hours; 54 lab hours)**
Automation 1- Industrial Control Systems
Advisory: ELEC A111 and ELEC A112.
Grading Mode: Standard Letter
Transfer Credit: CSU.
This course is a hands-on study of the basics of industrial control systems. Students will learn how to control various processes without the use of PLCs such as temperature control, liquid level control and conveyor motor control. Students will gain proficiency drafting schematics and wiring diagrams and experience wiring control systems using terminal blocks. This course will focus on relays, motor drives (VFDs), motor contactors, photo eyes, thermocouples, and contact limit switches. Students will learn how to implement emergency stop circuitry and add safety components.

ELEC A135   **4 Units (54 lecture hours; 54 lab hours)**
Symbolic Logic with Digital Applications
Advisory: Math placement above MATH A030, or ELEC A047 or concurrent enrollment; and ELEC A173.
Grading Mode: Standard Letter
Transfer Credit: CSU.
Introduction to logic as it applies to discrete Boolean mathematics, deductive reasoning, and digital applications including computer programming, architecture, and embedded systems. An in-depth study of obverse, inverse, AND/OR logical operations. Boolean algebra techniques are applied to simplify complex equations. Students will build, measure, test, analyze and troubleshoot series, parallel and complex circuits. Reading documentation commonly found in industry, i.e., schematics, specifications, assembly and test procedures, will also be included.

ELEC A140   **3 Units (54 lecture hours)**
Technical Electronics
Grading Mode: Standard Letter
Transfer Credit: CSU.
An introduction to electricity and electronics for non-technicians. Vocabulary, power, voltage, current, resistance, safety, test equipment, circuits and devices are studied. Students will build, test, and troubleshoot circuits and devices. In addition, students will learn how to read documentation commonly found in industry, i.e., schematics, specifications, assembly and test procedures.

ELEC A172   **1 Unit (54 lab hours)**
Electronics Laboratory 2
Prerequisite(s): ELEC A150 or ELEC A201 or ELEC A246 or concurrent enrollment.
Grading Mode: Standard Letter
Transfer Credit: CSU.
Second semester laboratory will reinforce safe shop practices, maintenance & instrument handling procedures, technical documentation, and workspace preparation. Student will work on AC and/or DC circuit projects. Mastery of theory, technical documentation, assembly skills, and teamwork skills will be emphasized.

ELEC A173   **1 Unit (54 lab hours)**
Electronics Laboratory 3
Prerequisite(s): ELEC A135, ELEC A155, ELEC A260 or concurrent enrollment.
Grading Mode: Standard Letter, Pass/No Pass
Transfer Credit: CSU.
Third semester laboratory will develop essential skills for a Test Technician: research, documentation, prototype construction, diagnostics methods and, critical thinking skills. Students will work on A/C circuit, robotics and/or semiconductor circuit for motor control projects. They will develop essential skills for a Test Technician: research, documentation, prototype construction, and diagnostics methods. Graded or Pass/No Pass option.

ELEC A174   **1 Unit (54 lab hours)**
Electronics Laboratory 4
Prerequisite(s): ELEC A245 or ELEC A253 or ELEC A260 or concurrent enrollment.
Grading Mode: Standard Letter, Pass/No Pass
Transfer Credit: CSU.
Fourth semester laboratory develops technical and leadership skills essential for the Industrial Automation Technician, including design, strategic planning, problem solving, and project management. Students will demonstrate the ability to oversee project through the entire process, from design through commissioning of complex systems per client specifications. Graded or Pass/No Pass option.

ELEC A215   **3 Units (54 lecture hours)**
Communications Systems
Prerequisite(s): AMT A182.
Grading Mode: Standard Letter
Transfer Credit: CSU.
A study of basic communications systems, including AM, FM, television, radar, antennas, and transmission lines.

ELEC A223   **4 Units (54 lecture hours; 54 lab hours)**
Embedded Control Systems
Advisory: ELEC A111.
Grading Mode: Standard Letter
Transfer Credit: CSU.
An advanced course designed to develop hands-on skills and knowledge of microchips used in embedded systems. Emphasis is on the ATmega microprocessor as implemented on the Arduino Development Platform. Students will learn how to develop circuits, integrate sensors, control outputs, write code in C, and compile and flash programs to the microprocessor. This course includes an introduction to Real Time Operating Systems (RTOS) commonly used in embedded control systems.

ELEC A224   **3 Units (36 lecture hours; 54 lab hours)**
Digital Communication Systems
Advisory: ELEC A111.
Grading Mode: Standard Letter
Transfer Credit: CSU.
Communications system is a hands-on overview of the numerous electronic means of communication. This course focuses on wireless communications, serial communication, and networked systems. Students will learn how electrical signals are modulated to carry data across a variety of channels. Communication protocols covered include AM, FM, FSK, FHSS, WIFI, xBee, ZWave, Cellular Networks, GNSS, i2c, UART, RS485, USB, Ethernet/IP, DOCSIS, Fiber, ModBus, CAN, and ControlNet to name a few. Students will use these protocols to establish communication links between devices in the lab.

ELEC A232   **4 Units (54 lecture hours; 54 lab hours)**
Automation 2 - Programmable Logic Controller
Advisory: ELEC A111.
Grading Mode: Standard Letter
Transfer Credit: CSU.
Students will learn how to connect to PLCs, upload and backup programs, and obtain diagnostic data from operational PLCs. This course is a hands-on course that uses both Allen-Bradley and Siemens control systems. Students will become proficient at interpreting and drafting ladder logic diagrams. This course will cover connecting various process sensors to PLC inputs as well as connecting relays to outputs to drive motor contactors, indications, and handshaking. Students will learn to describe a control process in documentation and then implement the process using ladder logic programming on the PLC.

ELEC A233   **4 Units (54 lecture hours; 54 lab hours)**
Automation 3 - Industrial Networks, HMI, and SCADA
Advisory: ELEC A232.
Grading Mode: Standard Letter
Transfer Credit: CSU.
This course covers connecting PLCs and control components together using industrial network protocols. Students will learn how to create Human Machine Interfaces (HMIs) which are touch displays that control industrial processes. Finally, students will learn how to implement Supervised Control and Data Acquisition (SCADA) systems to collect data and monitor a network of PLCs.

ELEC A260   **4 Units (54 lecture hours; 54 lab hours)**
Automation 2 Semiconductor Motor Control Circuits
Advisory: ELEC A047, ELEC A135, ELEC A150, and ELEC A173 or concurrent enrollment.
Grading Mode: Standard Letter
Transfer Credit: CSU.
Diagnose semiconductor circuits for industrial motor control: power supplies, amplifiers, active filters, oscillators, solid state motor control, phase inverters, Variable Speed Drives (VSD).

ELEC A289   **2 Units (18 lecture hours; 72 other hours)**
Internship
Prerequisite(s): ELEC A135 and ELEC A155.
Co-requisite(s): ELEC A102.
Grading Mode: Standard Letter, Pass/No Pass
Transfer Credit: CSU.
A supervised internship, as an assembler or technician, with scope of work related to classroom-based instruction previously completed. The student will research companies and prepare for internship interview. Course includes a directed study of the worksite environment, assigned duties, techniques and skills required for job performance. Student will complete objectives specified by the employer. May be taken for grades or on a pass-no pass basis. Graded or Pass/No Pass option.

ELEC A290   **3 Units (36 lecture hours; 54 lab hours)**
Electronic Troubleshooting
Advisory: ELEC A111 and ELEC A112.
Grading Mode: Standard Letter
Transfer Credit: CSU.
In this course students will develop the fundamental problem solving skills necessary to troubleshoot simple and complex electronic circuits. Students will learn how to identify problems, localize problems to subsystems, and sequentially test a circuit to quickly identify faulty components or subsystems. Students will gain hands-on experience with diagnostic tools such as multimeters, oscilloscopes, spectrum analyzers, and current clamps. Finally, students will learn to solve these issues by weighing the cost of repair or replacement.