

# ENGINEERING TECHNOLOGY (ENG)

## **ENG 103 C Introduction to Embedded Systems 3 Units**

Term hours: 54 lecture and 18 laboratory. This course provides an introduction to the foundational aspects of industrial automation, robotics, mechatronics, and computer integrated manufacturing. This course covers terminology, components, standards and methodologies in the process of design and implementation of advanced automated systems. It is intended for technicians, operators, designers, sales personnel, and other technical/automation professionals who are responsible for the operation, design, installation, and maintenance of such systems. (CSU)

## **ENG 105 C Instrumentation and Process Control 3 Units**

Term Hours: 54 lecture and 18 laboratory. This course covers the basic principles of process instrumentation, measurement, and control. Topics include properties of and methods to perform direct or inferred measurement to manage pressure, temperature, level, and flow to manage the operation of common final control elements. The course helps to identify and to configure basic open and closed-loop control algorithms with their associated communication methods. (CSU)

## **ENG 107 C Electricity and Electronics 3 Units**

Term hours: 54 lecture and 36 laboratory. This course is an introduction to electricity and electronics. It covers basic Electrical concepts such as direct current (DC), alternating current (AC) theories, (DC) and (AC) circuit types and circuit analysis, power generation and transmission. Components and applicable laws are also introduced in this course. Other topics to be covered are electronic components, as well as the conventional analog circuits used in electronic devices, including power supplies, amplifiers, power-handling circuits, filters, sensing and measurement circuits, and oscillators. An introduction to digital electronics, devices, and digital signal processing is also covered. (CSU)

## **ENG 109 C Industrial Design and Graphics 4 Units**

Term hours: 54 lecture and 54 laboratory. This is a course in Computer Aided Design. It starts with the introduction of the engineering design process and explains conceptualization and prototyping with the aid of CAD systems. The students learn about blueprint reading, creating sketches and proceeding to solid modeling. Other topics to be covered are making assemblies, create simulations and animations and run motion analysis. The creation of a bill of material, conversion to stereolithography files and G-codes for rapid prototyping purposes and Tolerances, surface finishes and other attributes of drawings to be addressed with projects involving systems and subsystems. (CSU)

## **ENG 115 C Electric Motors and Controls 3 Units**

**Prerequisite(s):** ENG 103 C and ENG 107 C with a grade of C or better.

Term hours: 54 lecture and 18 laboratory. This course is an introduction to the motors, different control mechanism and their classifications. It covers the basic principles, applications, and configuration of direct current and alternating current motors, motor starters, programmable modules, solid state, and electro-mechanical motor controllers/drives, input devices, relays, pilot devices, and other industrial electronic components and circuitry. (CSU)

## **ENG 120 C Mechanical Systems 3 Units**

**Prerequisite(s):** ENG 103 C and ENG 105 C with a grade of C or better.

Term hours: 54 lecture and 18 laboratory. This course provides students with the fundamental knowledge about mechanical components in a mechatronics system and skills necessary to install and maintain those components. It begins with an overview of Statics and Kinetics, which includes force system analysis, study of equilibrium, frames and machines, friction and effects of forces on the motion of objects and then moves to maintenance scheduling, hand and power tool use, power transmission systems, bearings, lubrication, couplings, pumps, alignment, and vibration analyzers within an automated or mechatronics system. (CSU)

## **ENG 125 C Hydraulic and Pneumatic Systems 3 Units**

**Prerequisite(s):** ENG 103 C and ENG 105 C with a grade of C or better.

Term hours: 54 lecture and 18 laboratory. This course covers the basics of hydraulic, pneumatic, and electro-pneumatic control circuits in a complex mechatronic system. Students will learn the functions and properties of control elements based on physical principles, and the roles they play within the system. Technical documentation such as data sheets, circuit diagrams, displacement step diagrams, and function charts will also be covered. (CSU)

## **ENG 150 C Digital Fundamentals and PLC Programming 4 Units**

**Prerequisite(s):** ENG 103 C and ENG 107 C with a grade of C or better.

Term hours: 72 lecture and 36 laboratory. This course is an introduction to the function and application of programmable logic controllers. Students will become familiar with the development of ladder logic diagrams for PLC applications, test input, and output configurations, create a communications configuration, design and save a motor control program, and adequately document the programming and the program file. Students also learn about programming and wiring of programmable logic controllers and software. Topics include bit-level input and output instructions, timers, counters, latches, documentation, and troubleshooting. (CSU)

## **ENG 160 C Industrial Data Network and HMI 3 Units**

**Prerequisite(s):** ENG 103 C and ENG 150 C with a grade of C or better.

Term hours: 54 lecture and 18 laboratory. This course introduces the principles of industrial communication, components, products, and systems to ensure an efficient integration of all sections of the industrial plant into one coherent system. System-wide, high-performance data networks will be implemented to meet the requirements of the industry by means of appropriate components based on proven standards. Elements of commercial and industrial electronic communications, transmission line characteristics, sensors, fiber-optic cabling, and systems, and other non-radio-based communication topics will be covered in this course. (CSU)

## **ENG 210 C Principles of Robotics Systems 3 Units**

**Prerequisite(s):** ENG 103 C with a grade of C or better.

Term hours: 54 lecture and 18 laboratory. This course offers a glance at the history of robotics and their evolution through time and evaluates how robots are used in industry. Through the course, different classes of robots are introduced, and students will become familiar with the basics of modeling, design, planning, and control of robot systems. The material provided in this course is a brief survey of relevant results from geometry, kinematics, statics, dynamics, and control. (CSU)

**ENGT 225 C Robot and Automation Programming****4 Units**

**Prerequisite(s):** ENGT 150 C and ENGT 160 C and ENGT 210 C, with a grade of C or better.

Term hours: 54 lecture and 54 laboratory. This course provides the students with the fundamental education in writing programs for embedded systems controlled by microcontrollers, PLC(s) and computers such as robots and other computer integrated systems. Students will acquire knowledge of work object frames, jogging the robots in multiple coordinate systems with the aid of program structure using modules and routines. Different programs such as C, Python, Matlab, AutoML, etc. will be introduced and reviewed. (CSU)

**ENGT 240 C Advanced Robotics****3 Units**

**Prerequisite(s):** ENGT 109 C and ENGT 225 C with a grade of C or better.

Term hours: 54 lecture and 18 laboratory. This course is the last of the three series in Robotics and focuses on actuator design, embedded computing, and complex response processes. Concepts of dynamic response as relates to vibration and motion planning will be presented. The principles of operation and interface methods with various actuators will be discussed, including pneumatic, magnetic, piezoelectric, linear, stepper, etc. Complex feedback mechanisms will be implemented using software executing in an embedded system. The necessary concepts for real-time processor programming, re-entrant code and interrupt signaling will be introduced. (CSU)

**ENGT 250 C Industrial Maintenance and Safety****3 Units**

**Prerequisite(s):** ENGT 115 C and ENGT 120 C and ENGT 125 C, with a grade of C or better.

Term hours: 54 lecture and 18 laboratory. This course is designed to meet the training needs of plant maintenance personnel engaged in the day-to-day troubleshooting and fault correction of industrial electrical and mechanical equipment. It is appropriate for mechatronics maintenance personnel in need of a review of electro-mechanical basics and an introduction to more complicated industrial controls and test equipment. It also aims to promote the highest degree of the physical, mental and social well-being of workers in an industrial plant through discussion of OSHA requirements for safety. (CSU)

**ENGT 255 C Integrated Automation Systems****3 Units**

**Prerequisite(s):** ENGT 160 C with a grade of C or better.

Term hours: 54 lecture and 18 laboratory. This course introduces the concept of Totally Integrated Automation within a manufacturing plant by looking at the automation pyramid emphasizing on Manufacturing Technologies, including CNC, CAM, and CIM. Micro-controllers, microprocessor architecture and ways of interaction between these and all other components will be discussed, and students can practice the theories through hands-on projects and digital simulation.

**ENGT 265 C Manufacturing Operation Management****3 Units**

**Prerequisite(s):** ENGT 109 C with a grade of C or better.

Term hours: 54 lecture and 18 laboratory. This course is designed to assist students gain an in-depth understanding of the technologies, processes, financial factors, and critical strategies that help with sustainability, productivity, and competitiveness in manufacturing by introducing a methodology for viewing the end-to-end of a manufacturing process through the application of theories and simulation. The students become familiar with Product Life-cycle Management to coordinate the information, processes, and people associated with the life-cycle of a product to achieve fewer production errors, fewer cycle iterations with the goal of ultimately increasing speed from design to market. (CSU)

**ENGT 290 C Industry 4.0, IIoT, Digitization****3 Units**

**Prerequisite(s):** ENGT 255 C and ENGT 265 C with a grade of C or better.

Term hours: 54 lecture and 18 laboratory. This class discusses the latest topics in technology and their effect on manufacturing. The main focus of this course would be Industry 4.0 or The Fourth Industrial Revolution that takes the automation of manufacturing processes to a new level by introducing customized and flexible mass production technologies, where the machines will operate independently, or cooperate with humans in creating a customer-oriented production field that continually works on maintaining itself. Among topics covered in this class are plant digitization, Industrial Internet of things, Augmented Reality, Machine Learning, and other advanced topics. (CSU)