1. *Course number and name*

**ENGR 294 Introduction to Microcontrollers**

1. *Credits and contact hours*

1 credit hours; 2 contact hours per week for seven and a half weeks.

1. *Instructor’s or course coordinator’s name*

Instructor: M. Azadi, Associate Professor of Mechanical Engineering

Course coordinator: M. Azadi, Associate Professor of Mechanical Engineering

1. *Text book, title, author, and year*

There is no required text, but a number of references are provided, depending on the actual type of microcontroller used in the course such as Microcontroller Kit: Arduino EXPLORE IOT KIT

* 1. *other supplemental materials*

Material available on <https://www.arduino.cc/education/explore-iot-kit>

Materials used in lectures shared OneNote Page

1. *Specific course information*
   1. *brief description of the content of the course (catalog description)*

Introduction to the operating principles of microcontrollers. Programming of microcontrollers to read sensor inputs and produce control outputs. Hands-on applications involving actuators, peripherals, and electromechanical circuits. (Plus-minus letter grade only)

* 1. *prerequisites or co-requisites*

Engineering students in sophomore year or later.

* 1. *indicate whether a required, elective, or selected elective course in the program*

Elective for Mechanical Engineering; Elective for Electrical Engineering

1. *Specific goals for the course*

* 1. *specific outcomes of instruction, ex. The student will be able to explain the significance of current research about a particular topic.*

1. Students are introduced to the use of a standard microcontroller in embedded control systems applications
2. Students will become familiar with typical features of a simple microcontroller
3. Students will become familiar with standard peripherals such as Logic Inputs/Outputs, Analog-to-Digital-Converter, Timers, Interrupts, and Serial Communication
4. Students will be introduced to NI MyRio
5. Peripherals such as Logic Inputs/Outputs, Analog-to-Digital-Converter, Timers, Interrupts, and Serial Communication
6. Students will obtain hands-on experience in designing simple electro mechanical systems and implementing them using the microcontroller  
     
   1. *explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.*

Course addresses ABET Student Outcome(s): 1, 2, 6

1. *Brief list of topics to be covered*
2. Introduction to Microcontrollers
3. Introduction to Labview
4. Analog to Digital and Digital to Analog Conversion
5. Pulse Width Modulation (PWM); Duty Cycle; Configuration and Usage
6. Reading sensor data and activating actuators