1. **Course number and name**  
**ENGR 410: Process Instrumentation and Control**

2. **Credits and contact hours**  
3 credit hours; three 50-minute lecture sessions/week, or two 1-hr-15-minute lecture sessions/week, depending on semester

3. **Instructor’s or course coordinator’s name**  
Course coordinator: Mojtaba Azadi, Assistant Professor of Mechanical Engineering

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

   a. **other supplemental materials:**
   - Ogata, K. “Modern Control Engineering”, 5th Ed. Prentice Hall, 2010

5. **Specific course information**
   a. **brief description of the content of the course (catalog description)**
      Principles of control and instrumentation. Control of level, flow, temperature, and pressure. Actuators and transducers. Process modeling

   b. **prerequisites or co-requisites**
      ENGR 300: Engineering Experimentation, ENGR 305: Linear Systems Analysis

   c. **indicate whether a required, elective, or selected elective course in the program**
      Required / Elective for Mechanical Engineering and Elective for Electrical Engineering

6. **Specific goals for the course**
   a. **specific outcomes of instruction**
      - Students learn the principles of control theory with emphasis on process control and some of its specific applications in actual industrial systems.
      - Students learn techniques of process modeling and linearization.
• Students become familiarized with standard process control configurations.
• Students learn about the state space approach to modelling and control and would be able to use MATLAB, Simulink and symbolic computations for modelling, linearization and control simulations.
• A working knowledge of basic techniques of process control and measurement and their applications in the design of process-control systems is provided to students.
• Students develop basic process control design skills including development of component specifications, control-valve sizing techniques, preparation of Piping & Instrumentation Diagrams, tuning of PID controllers and system identification.

b. 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): a, c, d, e, g, h, i, j, k.

7. Brief list of topics to be covered

• Process Control: Terminology and Definitions
• Modeling of Simple Processes and Their Linearization
• The State Space Approach
• MATLAB and Simulink for Modeling, Linearization and Control
• Discrete Time Systems and z Transform
• Control Valves
• Process Instrumentation
• Basics of Process Control
• System Identification
• PID Design and Tuning of Simple Control Loops
• Feed-Forward, Cascade and Multivariable Control
• Advanced Control Configurations