

1. *Course number and name*

**ENGR 411: Instrumentation and Process Control laboratory**

2. *Credits and contact hours*

1 credit hour; one 2 hr 30 min laboratory session/week.

3. *Instructor's or course coordinator's name*

Course coordinator: Mojtaba Azadi, Assistant Professor of Mechanical Engineering

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

None required.

a. *other supplemental materials*

6. McMillan, G.K. and D. Considine "Process/Industrial Instruments and Control Handbook", 5th Ed., McGraw-Hill, 1999
7. Anderson "Instrumentation for Process Measurement and Control" 3rd ed. CRC Press, 1998.
8. Smith, C.A. and Corripio, A.B. "Principles and Practice of Automatic Process Control" 3rd ed. John Wiley, 2006.
9. Additional reading material on ISA standards and codes will be provided during laboratory briefing sessions.

5. *Specific course information*

a. *brief description of the content of the course (catalog description)*

Instrumentation for measurement of flow, temperature, level and pressure. Experiments on level, flow, and temperature control. P, PI, PID, and programmable logic controllers.

b. *prerequisites or co-requisites*

ENGR 410: Process Instrumentation and Control (maybe taken concurrently)

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

Required/Elective for Mechanical Engineering; Elective for Electrical Engineering.

6. *Specific goals for the course*

a. *specific outcomes of instruction.*

- Students will acquire the ability to design basic process control configurations using standard algorithms and process instrumentation typically used in industry.
- Students will acquire hands-on experience with basic industrial instrumentation.
- Students will acquire a working knowledge of the basic control strategies used in the control of industrial processes.
- Students will be able to develop P&ID and spec sheets for simple control systems.

- Students will be able to trace control loops in industrial systems.
- Students become familiarized with system simulation and control with MATLAB/Simulink.

*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, b, c, e, g, i, j, k.

7. *Brief list of topics to be covered*

- Calibration of Sensors
- Calibration of Final Control Elements
- Loop Tracing and ISA Standards
- Commissioning a Flow Control Loop with a Digital Controller
- Level Control Using "P" and "PI" Controllers.
- Temperature Control Loop with Cascade and Ratio Control
- Dynamics of Control Loop-Tuning
- Simulink and MATLAB Simulations