

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*

- McMillan, G.K. and D. Considine "Process/Industrial Instruments and Control Handbook", 5th Ed., McGraw-Hill, 1999
- Anderson "Instrumentation for Process Measurement and Control" 3rd ed. CRC Press, 1998.
- Smith, C.A. and Corripio, A.B. "Principles and Practice of Automatic Process Control" 3rd ed. John Wiley, 2006.
- 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