1. *Course number and name*

**ENGR 410: Process Instrumentation and Control**

1. *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

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

Course coordinator: Mojtaba Azadi, Associate Professor of Mechanical Engineering

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

Smith, C.A. and Corripio, A.B. Principles and Practice of Automatic Process Control, 3rd Ed., John Wiley, 2006

1. *other supplemental materials:*
2. Seborg, D.E. et al. "Process Dynamics and Control", 4th Ed., Wiley, 2017
3. King, M. "Process Control: A Practical Approach", 2nd Ed., Wiley, 2016
4. Marlin, T. "Process Control", McGraw-Hill, 2nd Ed., 2000
5. Ogata, K. “Modern Control Engineering”, 5th Ed. Prentice Hall, 2010
6. McMillan, G.K. and D. Considine. “Process/Industrial Instruments and Control Handbook”, 5th Ed., McGraw-Hill, 1999
7. MATLAB & Simulink Student
8. Interactive Control Systems Tutorial (available on the web)
9. *Specific course information*
10. *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

1. *prerequisites or co-requisites*

ENGR 300 Engineering Experimentation, ENGR 305: Linear Systems Analysis or ENGR 307: Systems Dynamics and Mechanical Vibrations

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

Required / Elective for Mechanical Engineering and Elective for Electrical Engineering

Mechanical Students can alternatively take ENGR 447/ENGR 446 instead of ENGR 410/ ENGR 411.

1. *Specific goals for the course*
2. *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.

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 ,3 ,4 ,5 , 7

1. *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