1. *Course number and name*

**ENGR 447: Control Systems**

1. *Credits and contact hours*

3 credit hours; three 75-minute lecture sessions/week, or two 1-hr-15-minute lecture sessions/week, depending on semester

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*

Nise, N.S., Control Systems Engineering, (Seventh Edition), John Wiley, 2015

1. *other supplemental materials*

Ogata, K.: *Modern Control Engineering* (Fifth Edition), Prentice-Hall, 2009

Dorf, R.C., and Bishop, R.H., *Modern Control Systems*, 11th Edition, Pearson Prentice-Hall Inc., 2008

Golnaraghi,F and Kuo, B.C., *Auotmatic Control Systems*, (Ninth Ed), John Wiley, 2010

MATLAB & Simulink Student

Interactive Control Systems Tutorial (available on the web)

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

Analysis and design of continuous and discrete control systems. Systems modeling and stability. System compensation using root-locus and frequency domain techniques. Transfer functions, and state-space representation. Control of systems using state-space methods.

1. *prerequisites or co-requisites*

ENGR 305 - Linear Systems Analysis OR Engr 307- Systems Dynamics and Mechanical Vibrations with grade of C- or better.

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

Required for Electrical Engineering.

Required/Elective for Mechanical Engineering; Mechanical Students can alternatively take ENGR 410/ ENGR 411 instead of ENGR 447/ENGR 446.

Elective for Computer Engineering.

1. *Specific goals for the course*

*a. specific outcomes of* instruction*,*

* Students will be familiar with the fundamental concepts of Control Theory
* Students will be introduced to the basic techniques of time and frequency domain analysis.
* Students will be able to interpret control system specifications
* Students will be able to develop performance criteria for simple everyday control systems
* Students will be able to design appropriate controllers for practical systems.
* Students will be able to use standard software for designing controllers.
* Students will use the Mathworks Control Systems Toolbox for implementing the various controller design techniques.

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, 4, 5, 7

1. *Brief list of topics to be covered*

* Review of basic systems concepts
* Transfer Functions and block diagram reduction
* System formulation in State-Space
* Effect of system parameters on system response
* System performance specifications in time domain
* System Stability
* Root Locus Method
* Frequency Characteristics of systems
* Bode Plots and Nyquist Stability Criterion
* System Specifications in frequency domain
* Classical Compensator Design Methods
* Design in State Space
* Design of Controllers and Observers