1. *Course number and name*

**ENGR 446: Control Systems Laboratory**

1. *Credits and contact hours*

1 credit hour; one three-hour session/week

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
 None required
2. *other supplemental materials*

MATLAB and its control related toolboxes (Available to all SFSU students)

Quanser Teaching Material and Quanser learning Hardware (Will be available to enrolled students)

Mathworks.com resources for students such as onramps.

1. *Specific course information*
2. *brief description of the content of the course (catalog description)*
Simulation and modeling of control systems using Matlab and Simulink. Control experiments using servomotors and industrial emulators. Control project. Laboratory. (Plus-minus letter grade only)
3. *prerequisites or co-requisites*

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

and ENGR 447- Control Systems (Recommended to be taken concurrently).

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 basic concepts of system simulation
* Students will be reasonably well versed in the use of Simulink
* Students will be able to simulate systems from verbal system descriptions
* Students will be introduced to simulation techniques for hybrid systems
* Students will be familiar with basic procedures associated with interfacing real-life systems with computer-based controllers.
* Students will be able to write short technical memos to report the results of their simulations
* 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, 3, 6, 7

1. *Brief list of topics to be covered*
* Review of basic systems concepts
* Effect of system parameters on system response
* Use of Simulink in simulation of continuous systems
* Simulink tools
* Using of simulation in evaluating controller design
* Basic introduction to the use of microcontrollers in control systems