

San José State University
Charles W. Davidson College of Engineering
Department of Mechanical Engineering
ME 282, Nonlinear and Adaptive Control, Spring 2020

Instructor:	Saeid Bashash
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Office Hours:	Tu & Th 17:00-18:00 or by appointment
Class Days/Time:	Tu & Th 18:00 including nonlinearities, parametric uncertainties, and disturbances; phase plane and Lyapunov stability methods for nonlinear systems; sliding mode, adaptive, and adaptive-sliding control design with real-world applications; nonlinear observers, and repetitive learning control.

Course Learning Outcomes

Upon successful completion of this course, students will be able to:

1. Design PID controllers with anti-windup feature
2. Design tracking controllers for linear state-space systems
3. Analyze stability of nonlinear systems using Lyapunov and phase-plane methods
4. Design stabilizing controllers for nonlinear systems
5. Design robust sliding mode controller for linear and nonlinear systems
6. Design adaptive and adaptive-sliding controllers
7. Develop and analyze nonlinear state observers
8. Develop feedforward control logics using repetitive learning method

Required Texts/Readings/Materials

Lecture notes will be uploaded to Canvas on a regular basis. There is no required textbook for this course. The following references are recommended, particularly the first reference:

- J. J. E. Slotine and W. Li, *Applied Nonlinear Control*, Prentice Hall, 1991.
- H. K. Khalil, *Nonlinear Systems*, 3th Edition, Prentice Hall, 2001.
- H. Marquez, *Nonlinear Control Systems: Analysis and Design*, Wiley, 2003.

Required Software

MATLAB and Simulink

Full MATLAB package is available on the ME computer lab machines at ENG-215. However, since most of the assignments and projects will be MATLAB-based, it is highly recommended to purchase the Student Suite (without any additional toolboxes) from:

https://www.mathworks.com/store/link/products/student/SV?s_t

