

**San José State University**  
**Mechanical Engineering**  
**ME280, Automatic Control Engineering, Fall, 2022**

Instructor(s): Neyram Hemati  
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Office Hours: Monday & Wednesday 8:45-9:45  
Class Days/Time: Monday & Wednesday 7:30-8:45  
Classroom: Engineering 303  
Prerequisites: BSME or consent of instructor

**Course Description:**

Formulation of dynamic systems in state space form. System transient response, stability, controllability, and observability. Design of control systems using conventional and modern methods. Computer aided dynamic system analysis, control system design and simulation. Matlab will be used as the computational tool in design and analysis of control systems.

**Course Format**

“Success in this course is based on the expectation that students will spend, for each unit of credit, a minimum of 45 hours over the length of the course (normally three hours per unit per week) for instruction, preparation/studying, or course related activities, including but not limited to internships, labs, and clinical practice. Other course structures will have equivalent workload expectations as described in the syllabus.”

**Final Examination and Evaluation**

**Textbook:** Modern Control Engineering, 5<sup>th</sup> Edition, by K. Ogata, Prentice Hall, 2009.

<b>Grading:</b>	HW	10%
	Exam #1	25%
	Exam #2	25%
	Final	40%

**HW:** The due dates for the HW will be announced at the time when assigned.  
No late HW will be accepted.

**Final Exam Time:** Wednesday, December 7, 2022; 7:45-10:00 PM

**References:**

1. “Linear State-Space Control Systems,” by R.L. Williams II and D.A. Lawrence, Wiley.
2. “Modern Control Systems,” by William L. Brogan, Prentice Hall.
3. “Fundamentals of Linear State Space Systems,” by John S. Bay, McGraw Hill, Inc..
4. “Feedback Control of Dynamic Systems,” by Franklin, Powell, and Emami-Naeini, Addison-Wesley.
5. “Modern Control Systems,” by Dorf and Bishop, Addison-Wesley.
6. “Control Systems Engineering,” by Norman Nise, Wiley.

**University Policies**

Per [University Policy S16-9](http://www.sjsu.edu/senate/docs/S16-9.pdf) (<http://www.sjsu.edu/senate/docs/S16-9.pdf>), relevant university policy concerning all courses, such as student responsibilities, academic integrity, accommodations, dropping and adding, consent for recording of class, etc. and available student services (e.g. learning assistance, counseling, and other resources) are listed on [Syllabus Information web page](https://www.sjsu.edu/curriculum/courses/syllabus-info.php) (<https://www.sjsu.edu/curriculum/courses/syllabus-info.php>). Make sure to visit this page to review and be aware of these university policies and resources.

## AUTOMATIC CONTROL ENGINEERING

<b>Date</b>	<b>Topics</b>	<b>Readings</b>
8/22	Introduction	Ch. 1-3
8/23	Review of Classical Control Systems	Ch. 5-6
8/28	Using Matlab to Design Feedback Control Systems	
8/30	State Variable Representation of Dynamic Systems	Ch. 2-3
9/5	Labor Day	
9/7	State Variable Representation of Dynamic Systems	Ch. 2-3
9/12	Review of Linear Algebra	Ch. 9.1-2
9/14	Functions of Matrices	Ch. 9.5
9/19	Solving Linear State Equations	Ch. 9.3,5
9/21	Solving Linear State Equations	Ch. 9.3,5
9/26	Using Matlab to Solve State Equations	
9/28	Exam #1	
10/3	Controllability	Ch. 9.6
10/5	Controllability	Ch. 9.6
10/10	Observability	Ch. 9.7
10/12	Observability	Ch. 9.7
10/17	Design of Control Systems in State Space	Ch. 10.1-4
10/20	Design of State Observers	Ch.10.5-7
10/25	Design of State Observers	Ch. 10.5-7
10/26	Observer-Based Control Systems	Ch. 10.5-7
10/31	Using Matlab to Design Observer-Based Control Systems	
11/2	Observer Controller	Ch. 10.5-7
11/7	Exam #2	
11/9	Matlab Implementation	
11/14	Digital Control Implementation	Notes
11/16	Digital Control Implementation	
11/21	Optimal Control & Kalman Filter	Ch. 10.8
11/23	Thanksgiving	
11/28	Nonlinear Control	Notes
11/30	Stability	Notes
12/5	Review	