

**School of Engineering
University of California, Merced**

ME140 Vibration and Control

Fall 2018

Instructor	Jian-Qiao Sun SE2 270, (209)228-4540, jqsun@ucmerced.edu	
Office Hours	TR 5:00-6:00pm or by appointment	
Lecture	TR 4:30-5:45pm	SSB 160
Final Exam	T 8:00-11:00am December 11, 2018	SSB 160
TA	Mr. Frank Shangjie Ma Office Hours: WF 12:00-1:00pm Mr. Adrian Villegas Office Hours: MF 1:00-2:00pm	SE2 Entrance SE2 Entrance
Laboratory	SCIENG 172 Section 02L: M 9:00-11:50am Section 03L: W 1:30-4:20pm Section 04L: F 1:30-4:20pm Section 05L: W 9:00-11:50am	Adrian Villegas Adrian Villegas Frank Shangjie Ma Frank Shangjie Ma
Lab Coordinate	Salvador Diaz	SCIENG 124A
Textbooks	(Required) Mechanical Vibrations by S. S. Rao, Pearson Prentice Hall. Feedback Control of Dynamic Systems by G. F. Franklin, J. D. Powell and A. Emami-Naeini, Addison-Wesley Publishing Company.	
Reference Books	Modern Control Engineering (1970) by K. Ogata, Prentice-Hall, Inc. Modern Control Systems (1987) by R. C. Dorf, Addison-Wesley Publishing Co.	
Professional Component:	Engineering practice of vibration analysis and damping design for better fatigue life of structures including aircraft, automobiles and buildings. Feedback control to redesign the dynamics of mechanical systems.	
Grading	In-Class Quiz	(5%)
	Homework	(10%)
	Lab Reports	(25%)
	3 Midterms	(60%)

Course Outline

Duration	Topics	Reading
5½wks	Introduction to Vibration Review of mathematical foundation Vibration of SDOF Oscillators Free, damped and forced vibrations	Ch 1-4 (Rao)
Laboratory 1	Estimation of m-c-k Coefficients of SDOF Systems	
Laboratory 2	Forced Vibration Measurements of SDOF Systems	
½wk, Oct 4, Th	1 st Midterm on Vibration Analysis of SDOF Systems	
2wks	Vibration Analysis of MDOF Systems Two DOF oscillator Absorber demonstration Resonant frequencies Normal modes Damped and forced response	Ch 5-6 (Rao)
Laboratory 3	Mode Shapes and Resonant Frequencies of MDOF Systems	
2wks	Vibration of Continuous Structures String, rod, beam, and plate	Ch 8 (Rao)
	Applications of Vibration Theory Balancing, isolation, absorber, machine condition monitoring and diagnosis	Ch 9-10 (Rao)
Laboratory 4	Prediction of Mode Shapes and Resonant Frequencies of a Cantilever Beam	
½wk, Nov 1, Th	2 nd Midterm on Vibration Analysis of MDOF Systems	
5wks	Feedback Controls Stability concepts Transfer function and block diagram PID control, Root locus, Frequency domain State space	Ch 3-7 (FPE)
Laboratory 5	PID Control of a SDOF Oscillator	
Dec 11, T	3 rd Midterm on Feedback Control	Total: 15 wks