



California State University, Chico  
Mechanical and Mechatronic Engineering and Sustainable Manufacturing  
**MECH 424: Mechanical Vibrations**  
Fall Semester 2018

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**Instructor:** Dr. Dennis O'Connor

**Office Hours:** O'Connell 417, Tuesdays and Thursdays (10:00 - 11:50AM)

**Contact:** 530-898-4829, dmoconnor@csuchico.edu

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**Textbooks:** *Mechanical Vibrations* (6th Edition) by Singiresu S. Rao, Pearson 2017.

**Prerequisites:** MECH 320 Dynamics.

**Lecture:** Glen Hall 212, lectures MW 4:00 - 5:15pm.

**Grading:** Overall course grade will be based on homework and activities, project, and exams. Letter grades will be assigned according to the following table.

- ❖ Homework and Activities 20%
- ❖ Vibration Project 20%
- ❖ Exams 60%

[90,100]	A
[80,90)	B
[70,80)	C
[60,70)	D

**Homework:** Problem sets will be posted on the Blackboard class site and will be collected at the START of the class period on the due date specified. Late homework, including after the start of class, will not be graded. Work should be legible and the final answer of each problem enclosed in a box.

**Activities:** Each topic covered in class may have one or more associated activities in the form of an in-class paper assignment or take-home computer based simulation. All homework and activities will be of equal worth.

**Vibration Project:** The vibration project in MECH 424 will be a self-directed group assignment requiring the practice of developing a mechanical model and experimental validation. That is, groups will approximate the dynamic motion of a system/part with an equation of motion and observe its motion through simulation and experiment. Groups will have access to professional vibration instrumentation and equipment on a first come first serve basis. Additionally, most smart phones are equipped with vibration measuring sensors and may offer sufficient accuracy and data collection.

**Exams:** There will be two standard class exams and a two-hour final exam for the semester, all of equal worth, 20%. Exams will be open-book and open-note, paper only. For full credit, each answered question must demonstrate sufficient work and maintain correct units.

**Course Schedule:** The following table is a tentative course schedule outlining the chapters covered and approximate time for the Tests.

Week	Dates	Topics	Readings
1	Aug 27 – Aug 31	Ch.1 Fundamentals of Vibration	1.1 – 1.6
2	Sept 3 – Sept 7	...	1.7 – 1.12
3	Sept 10 – Sept 14	Ch.2 Free Vibration Single-DOF	2.1 – 2.6
4	Sept 17 – Sept 21	...	2.7 – 2.12
5	Sept 24 – Sept 28	Ch.3 Harmonically Excited Vibration	3.1 – 3.8
6	Oct 1 – Oct 5	...	3.9 – 3.15
7	Oct 8 – Oct 12	Exam 1	
8	Oct 15 – Oct 19	Ch.4 Vibration Under General Forcing	4.1 – 4.5
9	Oct 22 – Oct 26	...	4.6 – 4.10
10	Oct 29 – Nov 2	Ch.5 Two-Degree-of-Freedom System	5.1 – 5.6
11	Nov 5 – Nov 9	...	5.7 – 5.12
12	Nov 12 – Nov 16	Exam 2	
13	Nov 19 – Nov 23	Thanksgiving Break	
14	Nov 26 – Nov 30	Ch.9 Vibration Control	9.1 – 9.6
15	Dec 3 – Dec 7	...	9.7 – 9.12
16	Dec 10 – Dec 14	Review	
17	Dec 17 – Dec 21	Final Exam	

**Course Objectives and Description:** Students will learn to develop mathematical models of mechanical systems to analyze and predict system performance in vibration response. Course coverage will include modeling of free and forced vibration in single and multiple degree-of-freedom systems, stability, resonance, equation solving, parametric investigations, vibration monitoring and control. Additionally, coverage will include vibration measurement and digital signal processing techniques to characterize system response and validate mechanical models. Students are expected to have an adequate working knowledge of computer programming and simulation such as with MATLAB.

**Academic Integrity:** Students are expected to be familiar with the University's Academic Integrity Policy. The policy on academic integrity and other resources related to student conduct can be found at: <http://www.csuchico.edu/sjd/integrity.shtml>.

**Americans with Disabilities Act:** If you need course adaptations or accommodations because of a disability or chronic illness, or if you need to make special arrangements in case the building must be evacuated, please make an appointment with me as soon as possible, or see me during office hours. Please also contact Accessibility Resource Center (ARC) as they are the designated department responsible for approving and coordinating reasonable accommodations and services for students with disabilities. ARC will help you understand your rights and responsibilities under the Americans with Disabilities Act and provide you further assistance with requesting and arranging accommodations. Accessibility Resource Center (530-898-5959) and Student Services Center ([arcdept@csuchico.edu](mailto:arcdept@csuchico.edu)).

**Student Learning Center:** The mission of the Student Learning Center (SLC) is to provide services that will assist CSU, Chico students to become independent learners. The SLC prepares and supports students in their college course work by offering a variety of programs and resources to meet student needs. The SLC facilitates the academic transition and retention of students from high schools and community colleges by providing study strategy information, content subject tutoring, and supplemental instruction. The SLC is online at <http://www.csuchico.edu/slc>.