

Syllabus for ME4223
Vibrations
Spring, 2007



Course Information

Instructor: Dr. Maurizio Porfiri
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Office Hours: Thursday 12:00-12:55

Lectures: Monday 9:00-10:50 JAB674
 Thursday 5:00-5:55 JAB774

Webpage: My Poly

Course Goals

Students who completes this course should have a clear understanding of vibrations and modeling of mechanical systems. They will analyze free and forced vibrations and will develop mathematical techniques to model and design mechanical systems.

Required Text

Engineering Vibrations (2nd edition), Daniel J. Inman, Prentice-Hall, 2001.

Homework

Homework will be assigned periodically. However, homework will neither be collected nor graded. Students are responsible to do homework on their own. Homework solutions will be posted on the internet after a week.

Exams

There will be two mid-terms, a final exam and a final project. Tests will be administered in class and will test the student's comprehension and ability to apply material learned in class and through assignments. All tests are in-class, closed book, closed notes. Formula sheets prepared by students will not be allowed. During exams, before beginning to solve assigned problems, students should briefly restate the problem and list the data given. Also, students should list the important concepts and formulae used to arrive at the final solution along with detailed work. Every page of every exam submission should have the student full name and section number. Illegible work and loose sheets will not be graded. Students must complete all exams on their own. If a student cannot attend an exam due to a medical condition, certified by a doctor, he/she must notify the instructor in advance. In such a case, no makeup exam will be offered. Instead, the weight of the missed exam will be added to the following exam (if there is one remaining). Unexcused absence from an exam will result in a grade of 0 for that exam. Final projects will be assigned during the semester and students' groups will present their results during one or two lectures at the end of the semester. Beyond the presentation, a written report will be required for grade.

Students are responsible to check their grades on the internet and compare their solutions to those posted. Grades and solutions will be reasonably posted within 48 hours. Exams will be showed to the students after approximately a week from the day the grades are posted. Discussion of the grades will only be done during office hours.

Grading

This is a 3 credits course.

Policy

Homework:	0%
First Midterm Exam:	20%
Second Midterm Exam:	20%
Final Project:	20%
Final Exam:	40%

Letter Grade Policy

A: 93+, A-: 90+, B+: 85+, B: 82+, B-: 79+, C+: 74+, C: 71+, C-: 68+, D+: 63+, D: 60+, F: <60.

Topics

Textbook sections are indicated in parentheses. Students are responsible to read the material before the class.

- Fundamental concepts in vibration and modeling:
 - Introduction to modeling and analysis
 - Introduction to mechanical vibration
- Free vibration of single degree of freedom systems:
 - Undamped vibration (1.1)
 - Simple harmonic motion (1.2)
 - Damped vibration (1.3)
 - Modeling: Energy and Newton's methods (1.4, 1.5)
 - Measurement of vibrational components (1.6)
 - Design Consideration (1.7)
 - Stability (1.8)
- Forced harmonic excitation of single degree of freedom systems:
 - Undamped vibration (2.1)
 - Damped vibration (2.2, 2.3)
 - Base excitation (2.4)
 - Rotating unbalance (2.5)
 - Coulomb damping (1.10, 2.7)

- Vibration of single degree of freedom systems under general forcing conditions:
 - Impulsive inputs (3.1)
 - Arbitrary nonperiodic inputs (3.2, 3.4)
 - Arbitrary periodic inputs (3.3)
 - Stability (3.8)
- Vibration of multi degree of freedom systems:
 - Modeling (4.1)
 - Free undamped vibration (4.1)
 - Eigenvalue problem (4.2)
 - Modal analysis (4.3, 4.4)
 - Free damped vibration (4.5)
 - Forced vibration (4.6)
- Advanced topics

Other information

Guest speakers will be invited to present selected topics on vibration control and measurements.

ABET a-k criteria compliance

	<i>a</i>	<i>b</i>	<i>c</i>	<i>d</i>	<i>e</i>	<i>f</i>	<i>g</i>	<i>h</i>	<i>i</i>	<i>j</i>	<i>k</i>
ME3513	✓		✓	✓	✓	✓	✓		✓	✓	✓

- (a) an ability to apply knowledge of mathematics, science, and engineering
- (b) an ability to design and conduct experiments, as well as to analyze and interpret data
- (c) an ability to design a system, component, or process to meet desired needs
- (d) an ability to function on multi-disciplinary teams
- (e) an ability to identify, formulate, and solve engineering problems
- (f) an understanding of professional and ethical responsibility
- (g) an ability to communicate effectively
- (h) the broad education necessary to understand the impact of engineering solutions in a global and societal context
- (i) a recognition of the need for, and an ability to engage in life-long learning
- (j) a knowledge of contemporary issues
- (k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.