EM611 “Vibration of Elastic Solids”
(3 credits)
Syllabus and Class Policy

Fall 2012
Tuesdays and Thursdays, 4:00 to 5:15 PM
Geology, Mathematics, and Computer Science Bldg, Room GMCS-305
San Diego State University

Instructor

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Please make sure to include the course name, EM611, in any email correspondence.

Office Hours

Tuesday and Thursday 1:45-2:45PM

Textbook

Ginsberg J. H., *Mechanical and Structural Vibrations: theory and applications*, New York: Wiley

Other useful books

Dynamic analysis using the Finite Element Method

Bathe K. J, *Finite Element Procedures in Engineering Analysis*, Prentice-Hall civil engineering and engineering mechanics series. Englewood Cliffs, N. J.: Prentice-Hall, 1982

Vibrations and structural dynamics

Singiresu S. Rao, *Mechanical Vibrations,* Pearson Prentice Hall. ISBN 0-13-048987-5

Thomson W. T. And Dahleh M. D., *Theory of vibration with applications*, Upper Saddle River, N. J.: Prentice Hall, 1998

Donaldson B. K., *Introduction to Structural Dynamics*, Cambridge aerospace series. Cambridge: Cambridge University Press.

Introduction to Aeroelasticity

Hodges D. H. And Pierce G. A., *Introduction to Structural Dynamics and Aeroelasticity*, Cambridge aerospace series, 15. Cambridge, [England]: Cambridge University Press.

Prerequisites

Engineering 510 and Aerospace Engineering 410 or Mechanical Engineering 520.
Students are expected to have basic understanding of kinematics and dynamics of rigid bodies (Rober W. Soutas-Little Daniel J. Inman, *Engineering Mechanics – Dynamics*, Prentice Hall, is a good example).
Prior programming skills (MATLAB) are recommended. The students will be asked to use MATLAB when programs need to be written.

Course objectives

The objective of this course is to introduce the student to the analysis of vibrations of elastic solids. The material presented in this course will provide the foundation for pursuing other courses such as aeroelasticity (EM600).

Course Outline

- Equation of motion for discrete systems
- Lagrange's equations
- Transient response of one degree-of-freedom systems
- Steady-state response to harmonic excitation
- Modal analysis of multi-degree-of-freedom systems
- Harmonic excitation of multi-degree-of-freedom systems
- Vibration of elastic bars
- Introduction to the Ritz method (1)
- Field descriptions for vibrating bars (1)
- Damped modal analysis: the state space (1)
- Dynamic stability (1)
- Introduction to aeroelasticity (1)

(1): The content of the course may change depending on students' interests and time constraints

Course Competencies

At the close of EM611 you should be able to...

1. Conduct a simplified analysis of one-degree-of-freedom and multi-degree of-freedom systems.

2. Calculate the mass matrix, stiffness matrix and the modes of the systems analyzed in the course.

3. Write the equations of motions using different methods.

4. Perform a transient response of a system similar to the ones analyzed in the class or in the homeworks.

5. Describe and summarize the main concepts of the subjects covered in the course with the inclusion of examples.

6. Solve problems similar to the ones discussed in the class and/or assigned in the homeworks.

Grading

In order to acknowledge achievements and monitor progress, the Department needs a realistic and meaningful system for grading performance. The University and the professional community expect the Department to maintain standards that reflect its reputation as one of the foremost programs of its type in the country. According to the University's Graduate Bulletin,

A means outstanding achievement; available for only the highest accomplishment;

B means praiseworthy performance; definitely above average;

C means average; awarded for satisfactory performance.

In general, professors in the department award "**A**" grades to acknowledge achievements that go beyond specified course requirements and criteria. By its very nature, this type of performance cannot always be spelled out clearly in advance. "**A**"s are reserved for special efforts that exceed expectations by demonstrating exceptional creativity, boldness, commitment, ingenuity, or elegance.

Grading Factors

Assignment/Activity	% of final grade
Homework. An homework is an assignment that requires several days to be completed. *Collaboration is not allowed*. The homework must be on the desk of the classroom before the lecture starts on the due date. *Late homework will be accepted, with penalty of 20%, on the due date only*. Quality of the presentation of the results (clarity, easy to follow etc.) is crucial.	**40**
Exams 1,2 and final exam (or final project). The students will be asked to describe the main concepts of some subjects covered in the first part of the course and/or to solve some problems similar to the ones analyzed in the class or homeworks before the middle-term exam date. The exams are *closed book and closed notes.* Quality of the presentation of the results (clarity, easy to follow etc.) is crucial.	**60**
TOTAL	**100**

Every assignment or activity will be graded in a scale of 100 points.

Reported Final Grades

A = 90 or higher

B = 80 or higher (but less than 90)

C = 70 or higher (but less than 80)

D = 60 or higher (but less than 70)

The instructor reserves the right to raise or lower the lower limit of each grade range such that division between letter grades occurs at large gaps in the grade spectrum.
Minor adjustments to avoid grades being decided by a fraction of a point may be adopted.

If you feel a mistake was made in grading any material involving (1) points not added or not recorded properly, (2) points taken-off for an answer that is not 100% correct, or (3) for given partial credit, please talk to the instructor either through e-mail or in person during the office hours.

Participation (classes)

Please do not come late to class sessions as it detracts from the learning experience of everyone involved. You should arrange in advance for a partner to take notes and obtain handouts for any class session you cannot attend.
Class participation will be used in deciding borderline grades.

Participation (seminars)

If a seminar is scheduled, all students must be present. Only University approved excuses for absences will be accepted in the case of seminars. Please note that an essay regarding the seminar is required and if you miss the seminar (for University approved excuses) then you can not write the related essay.

Accommodations for Students with Disabilities

Students with disabilities who need support services are encouraged to notify the instructor as soon as possible. This can be done confidentially via email or by phone (see instructor contact information).

Academic honesty

All students admitted to SDSU have signed a statement of academic honesty committing themselves to be honest in all academic work and understanding that failure to comply with this commitment will result in disciplinary action. This statement is a reminder to uphold your obligation as a student at SDSU and to be honest in all work submitted and exams taken in this class and all others

Plagiarism

Plagiarism consists of passing off as yours the work that belongs to someone else. As such, you will be committing plagiarism if you present someone else's work as your own, even with the other person's consent.

Miscellaneous

Taking pictures is not allowed.

The use of laptop is allowed in the classroom for the only purpose of taking notes. *Any other laptop use (e.g. cheking emails or searching the web) must be postponed until the class ends to avoid distractions for the other students*. A violator of this rule will be asked to turn off the computer.

The use of cell phones or equivalent devises is not allowed in the classroom.

Submitting copy of a homework prepared by somebody else is considered cheating.

Submitting a project which is copied in full or in part from other students' work is considered plagiarism.

Collaboration on a project or homework is not allowed unless specifically allowed by the instructor when the project/homework is assigned.