

Introduction to Dynamics of Aerospace Structures(ASEN 5022)

Spring 2012

TTh 3:30PM-4:45PM

ECST 1B21

http://www.colorado.edu/engineering/CAS/courses.d/ASEN5022.d/ASEN5022_2012.html

Course Description

This course covers dynamics principles (both Newtonian and variational treatments), structural vibrations, transient structural responses, vibration measurements, and applications of vibration principles. The course strives to offer a balanced coverage of theoretical aspects and modern computational methods for modeling, analysis and design of dynamical systems.

Instructor

Dr. K. C. Park
Office: ECAE 185
Telephone: 2-6330
E-mail: kcpark@colorado.edu

TA

TBD
Office:
Telephone:
E-mail:

Office Hours

Instructor: MW: 14:00-15:30Hr.

CA: TBD.

In addition to the regularly scheduled hours, the instructor and CA are also available by appointment.

Prerequisites

ASEN5012/MCEN 4063; APPM 2360/ MATH 3130, ASEN 2001, 2003, and 3112, or equivalent.

Reference Books

Principles and Techniques of Vibrations, by L. Meirovitch. Wiley Interscience Publication, New York, 2000.

Mechanical Vibrations, by M. Geradin and D. Rixen

Grading

Your grade in this course will be assessed by homework, exams, and class discussions with the following weights:

Homework 30%

Two mid-term exams: 30%

Final exam: 30%

Class participation: 10%

For distance learning students, there will be no class discussion requirement. The class discussion portion will be equally distributed into to midterm exams and projects (or final exams), i.e. two midterm exams will account 35% and final exam (or project) will account 35%.

Attendance

You are required to attend the class and are responsible for all materials and announcements in the class. Make-up class is only available in very special circumstances, such as illness.

Homework

Homework will be normally assigned on Thursdays. Homework will be due on the following Thursday before the class. It is your responsibility to check the class website to download homework assignments in time. E-mailing your homework is not accepted. Late homework will not be accepted unless arrangement is made with the instructor in advance and only under special circumstances, such as illness. Documents, such as doctor's note, should be presented to prove the special circumstances. Discussions on the homework are encouraged. Copying other people's homework, however, will result in no credit, and may lead to disciplinary action.

Joining E-mail List

This is automatically done by the system.

Policy Regarding Disabilities

If you qualify for accommodations because of a disability, please submit to me a letter from Disability Services in a timely manner so that your needs may be addressed. Disability Services determines accommodations based on documented disabilities. Contact: 303-492-8671, Willard 322, and www.Colorado.EDU/disabilityservices.

Policy Regarding Religious Observance

Campus policy regarding religious observances requires that faculty make every effort to reasonably and fairly deal with all students who, because of religious obligations, have conflicts with scheduled exams, assignments or required attendance. In this class, it is your responsibility to notify faculty at least two weeks in advance of the conflict to request special accommodation for your religious observance. In general, one day religious holiday is not qualified as a reason for a delayed homework. In the case of conflict of religious holiday with exam, special arrangement can be made.

Policy Regarding Classroom Behavior

Students and faculty each have responsibility for maintaining an appropriate learning environment. Students who fail to adhere to such behavioral standards may be subject to discipline. Faculty have the professional responsibility to treat all students with understanding, dignity and respect, to guide classroom discussion and to set reasonable limits on the manner in which they and their students express opinions. Professional courtesy and sensitivity are especially important with respect to individuals and topics dealing with differences of race, culture, religion, politics, sexual orientation, gender variance, and nationalities.

Class rosters are provided to the instructor with the student's legal name. I will gladly honor your request to address you by an alternate name or gender pronoun. Please advise me of this preference early in the semester so that I may make appropriate changes to my records.

Sexual Harassment Policy

The University of Colorado Policy on Sexual Harassment applies to all students, staff and faculty. Sexual harassment is unwelcome sexual attention. It can involve intimidation, threats, coercion, or promises or create an environment that is hostile or offensive. Harassment may occur between members of the same or opposite gender and between any combination of members in the campus community: students, faculty, staff, and administrators. Harassment can occur anywhere on campus, including the classroom, the workplace, or a residence hall. Any student, staff or faculty member who believes s/he has been sexually harassed should contact the Office of Sexual Harassment (OSH) at 303-492-2127 or the Office of Judicial Affairs at 303-492-5550. Information about the OSH and the campus resources available to assist individuals who believe they have been sexually harassed can be obtained at:

<http://www.colorado.edu/sexualharassment/>

Policy Regarding University Honor Code

All students of the University of Colorado at Boulder are responsible for knowing and adhering to the academic integrity policy of this institution. Violations of this policy may include: cheating, plagiarism, aid of academic dishonesty, fabrication, lying, bribery, and threatening behavior. All incidents of academic misconduct shall be reported to the Honor Code Council (honor@colorado.edu; 303-725-2273). Students who are found to be in violation of the academic integrity policy will be subject to both academic sanctions from the faculty member and non-academic sanctions (including but not limited to university probation, suspension, or expulsion). Other information on the Honor Code can be found at

<http://www.colorado.edu/policies/honor.html> and at <http://www.colorado.edu/academics/honorcode/>

Course Content

1. Introduction: transition from statics to dynamics, reference frames,
Newton's three laws, Galileo's relativity.
Problem solution via Newton's 2nd Law
2. Principle of Virtual Work and D'Alembert's Principle.
Hamilton's Principle and Euler-Lagrange's Equations.
3. Method of Lagrange's Multipliers
4. Continuum vibration of string, bar and shaft.
Boundary conditions on modes and mode shapes.
5. Vibration of Continuum Beams.
Vibration of continuum beams under various boundary conditions.
6. Finite Element Method for Vibration Analysis: Bars and Cables.
Finite Element Method for Vibration Analysis of Beams
7. Behavior of Structural Dynamics Equations, Damping, Similarity Laws.
Transient Response Analysis of Structural Dynamics Systems.
8. Application Examples:
Shock Isolation Systems
MEMS Resonator
Membranous Reflector & Others

Final Examination: Thursday, May 09, 1:30 – 4:00pm