

ME 470 – Mechanical Systems Vibrations

Fall 2014 (Section 69138)

MWF 1-1:50 pm, Room A0208

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Course Description¹:

Linear vibration analysis of mechanical systems. Design of mechanical systems to include effects of vibration.

Prerequisites: MATH 305 (Introduction to ODEs), ENGR 261 (Dynamics), and ENGR 351 (Numerical Methods).

Office Hours:

Monday and Wednesday from 1:50-3 PM, and Friday from 10-11 AM.

If you need to see me outside of these times, call or email for an appointment.

Textbook:

Meirovitch, L., 2001, *Fundamentals of Vibrations*, McGraw-Hill.

There are several other good books on mechanical vibrations. A few examples are given below. These can be valuable for better understanding of certain topics and for their example problems.

Inman, D. J., *Engineering Vibration*, 4th Edition, Prentice Hall.

Thomson, W. T., Dahleh, M. D., 1998, *Theory of Vibration with Applications*, 5th Ed., Prentice Hall.

Meirovitch, L., 1997, *Principles and Techniques of Vibrations*, Prentice Hall.

¹ Taken from the Southern Illinois University Carbondale Undergraduate Catalog.

Meirovitch, L., 1980, *Computational Methods in Structural Dynamics*, Sijthoff & Noordhoff International Publishers.

Grading:

Homework – 30%, Midterm – 30%, and Final Exam – 40%.

The final grades for the course will be assigned using the weighting above. The standard grade distribution at Southern Illinois University Carbondale is: A: 90-100%, B: 80-89%, C: 70-79%, D: 60-69%, and F: Below 60%.

Homework:

Homework problems will be assigned approximately weekly. Homework assignments are designed to be challenging. Students are expected to work hard, even struggle, with homework. *Late homework will not be accepted.*

Homework assignments must be written legibly. They must be presented clearly and logically. Homework grading depends on this. Homework is expected to communicate a student's mastery of the problem and course material. Excellent homework clearly shows the student understands every step in the solution.

Quizzes can be given at any time. They may not be announced beforehand. Quizzes will be counted toward the homework grade.

Academic Misconduct:

Academic misconduct is a violation of the Student Conduct Code and will not be tolerated. Academic misconduct is any activity which tends to compromise the academic integrity of the institution or subvert the educational process. Examples include plagiarism, cheating on examinations, and violation of course rules as contained in the course syllabus.

Course Material:a) Single degree of freedom system vibration

Equations of motion, free and forced response, damping, and transient and harmonic excitation.

b) Multi-degree of freedom system vibration

Equations of motion, Lagrange's equations, free and forced response, vibration absorbers, and modal analysis. Introduction to gyroscopic (spinning) system vibration.

c) Continuous system vibration

Vibration of elastic continuum, for example, strings, rods, beams, membranes, and plates.

Equations of motion, natural frequencies and vibration modes, and free and forced response calculations. Introduction to elastic waves.

Tentative Exam Schedule and Content:

The midterm will be given near the middle of the semester. It will be over all topics covered in class to that date. The midterm will be announced at least one week before it is given.

The final exam will cover all topics listed in the course material. The date and time is determined by the registrar's office.

No makeup exams will be given.