

Sample Syllabus

ME/EMch 470 – Analysis and Design in Vibration Engineering

Spring 2019

www.mne.psu.edu/chang/me470

Instructor: Dr. L. Chang – 322 Leonhard
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Office hours: 1:15-2:15 daily and by appointment

Prerequisites: ME370 or equivalence, MATH 220 or higher

Text: Current or previous ME370 textbook
Vibrations of Mechanical Systems by A Sinha, Cambridge, 2010 or
Mechanical Vibrations by S. S. Rao, Addison Wesley, 5th edition, 2011

Reference: Principles and Techniques of Vibrations by L. Meirovitch, Prentice Hall, 1996

The course covers mechanical vibrations at an intermediate level. It will be conducted light-loading with emphasis on big-picture thinking, understanding and connection. The approach aims at further developing one's intellectual caliber by promoting efficient and enjoyable learning.

Lecture topics

- I. Single degree-of-freedom systems
 - Review of basic SDOF vibration
 - Vibration with periodic excitation,
 - Vibration with non-periodic excitation, convolution integral
 - Vibration of non-linear system
- II. Multiple degree-of-freedom systems
 - Review of basic MDOF vibration
 - Lagrange formulation
 - Free vibration of undamped system, natural frequencies and mode shapes
 - Properties of system matrices and vectors, orthogonality of modal vectors, eigen-basis, expansion theorem
 - Forced vibration, solution by modal decomposition
- III. Continuous systems (infinite degrees of freedom)
 - Formulation
 - Free vibration, natural frequencies and mode shapes,
 - Self-adjointness, orthogonality of eigenfunctions
 - Forced vibration, solution by modal decomposition
 - Solution by approximation methods

Grading: Grades based on hws and class attendance

80 above = A, 75 = A-, 70 = B+, 65 = B, 60 = B-, 55 = C+, 50 = C, 40 = D

Each un-attendance = -2, 10 min late = -1