



PME 332000 Mechanical Vibrations

振動學

Spring 2020

Instructor:	Prof. Jen-Yuan (James) Chang 張禎元 教授	Credits:	3 credits.
Language:	This course will be offered in English		
Class meetings:	F1F2F3	Engineering Building I – R104	Office hours: Thursdays 17:00-18:00
Goal:	To gain a physical and mathematical understanding of how systems vibrate. First, we will gain a better understanding of how simple systems vibrate. We will then develop an understanding of the fact that complicated systems have “modes” of vibration that behave in a very similar way to simple systems. An additional goal will be to develop an understanding of some modern analytical and experimental techniques with a team work design project for vibration reduction/isolation.		
Textbook:	Singiresu S. Rao “Mechanical Vibrations,” 6 th SI Edition, Prentice Hall, 2018. Daniel J. Inman, “Engineering Vibration,” 4 th Edition, International Edition, Pearson Education Limited, England, 2014.		
Teaching Method:	Classroom lectures will be offered in both Chinese and English with teaching materials posted in Moodle.		
Assessments:	Quizzes	15%	Approximately 45 minutes/quiz, 3 quizzes total. Closed book and notes. Missed quizzes: Notify Prof. Chang in advance to make up the quiz.
	Lab assignment	10%	Two laboratory assignments, 4 students per group. Lab1: Estimating natural frequency and damping ratio Lab2: Forced vibration experiment
	Term project	15%	Group project, 4 students per group.
	Midterm Exams	30%	In-class individual efforts, closed book and notes
	Final Exam	30%	In-class individual effort, closed book and notes.

Schedule:

Lecture	Topic	Book Chapters	
		D. J. Inman	S.S. Rao
1	Introduction to Vibration & Fundamentals of Mechanical Vibration Phenomena	Chapter 1	Chapter 1
2	Newtonian Dynamics Linear Mechanical System	Chapter 1	Chapter 2
3	Newtonian Dynamics Rotational Mechanical System	Chapter 1	Chapter 2
4	Analytical Dynamics	Chapter 1.7, Chapter 4.7	Chapter 6
5	Free & Forced Vibrations of Single Degree of Freedom Systems	Chapter 2, Chapter 3	Chapter 2, 3, 4
6	Solving Dynamics and Vibrations with Laplace Transform	Chapter 3.4	Chapter 4, 5
7	Fourier Transform in Vibrations	Chapter 3.5	Chapter 1
8	Vibrations of Multi-DOF Systems	Chapter 4	Chapter 5, 6, 7
9	Forced Vibrations of Multi-DOF Systems	Chapter 4	Chapter 5, 6
10	Vibration Isolation and Absorption	Chapter 5	Chapter 9
11	Vibrations of Distributed-Parameter Systems	Chapter 6	Chapter 8
12	Practical Vibration Systems	Chapter 7	Chapter 10
13	Vibration Measurements & Experimental Modal Analysis	Chapter 7	Chapter 10
14	Introduction of Finite Element Method in Vibration Analysis	Chapter 8	Chapter 12