

MECH4850 –Vibration and Acoustics

Course Code: MECH 4850	Course Title: Vibration and Acoustics
Required Course Or Elective Course: Elective	Terms Offered (Credits): Fall or Spring (3 credits)
Faculty In Charge: Xun Huang	Pre-Requisites: (MATH 2010 OR MATH 2011 OR MATH 2021 OR MATH 2023) AND (MATH 2350 OR MATH 2351 OR MATH 2352) AND MECH 2020
Course Structure: Lecture – 3 hours per week; Tutorial – 1 hour per week	
Textbook/Required Material: French, A. P. Vibrations and Waves. Norton. References: [1] Dowling, Anne (1983). Sound and Sources of Sound. Ellis Horwood. [2] Other supplementary materials	
Course Description: An introduction to mechanical vibrations, waves and acoustics. The two lectures each week will try to explain fundamental concepts and analytically describe important vibration and acoustic physics related to aerospace engineering. Students are expected to spend no less than an additional four hours per week to go through lecture materials and prepare homework.	
Course Topics: <ol style="list-style-type: none"> 1. Introduction to vibrations and acoustics 2. Simple harmonic motion 3. Harmonically driven damped harmonic oscillator 4. Complete solution to the harmonically driven oscillator 5. Coupled oscillators 6. Driven coupled oscillators 7. The wave equation, solutions to the wave equation 8. Boundary conditions applied to pulses and waves 9. Wave equation in 2D and 3D time-independent Fourier analysis 10. Fourier analysis (cont.) 11. Fourier analysis with traveling waves, dispersion, group speed 12. Dipole radiation 13. Flat plate scattering 14. Duct acoustics 15. Duct radiation 16. Acoustic impedance and liner 17. Passive and active control (I)-(II) 	
Course Objectives:	<ol style="list-style-type: none"> 1. To introduce basic concepts of vibrations and acoustics 2. To provide students with fundamental understanding of vibrations and acoustics. 3. To equip student to grasp classical analysis methods of vibrations and acoustics.

Course Outcomes:	A. Become proficient in understanding and analyzing basic problems of vibrations and acoustics. B. The student will have a clear understanding of the fundamental concepts.
Assessment Tools:	Homework 30% Mid-term 30% Final 40%