



THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING

Wave Dynamics in Fluids

MECHENG 7520

Credit Hours:

3.00 - 3.00

Course Levels:

Graduate (5000-8000 level)

Course Components:

Lecture

Lab

Course Description:

Unsteady flows, small and finite amplitude wave propagation and attenuation in fluids, flow noise, nonlinear flow-acoustic coupling, surge, and wave suppressors.

Prerequisites and Co-requisites:

Prereq: 6505 (705), or permission of instructor.

Course Goals / Objectives:

- Develop a comprehensive understanding of unsteady internal fluid flows and their importance in engineering applications
 - Gain insight into the benefits of unsteady fluid motion (through tuning), and the challenges it poses (including airborne noise, flow noise, flow-acoustic coupling, and surge) as well as their remedies
 - Develop an ability to apply the fundamental principles of thermo-fluid science toward predicting small and large amplitude wave propagation and attenuation in ducts and wave reflectors (silencers)
 - Gain an appreciation of various practical unsteady flow physics through experiments and measurements in three (flow, acoustics, and engine) laboratories
 - Develop an understanding of contemporary predictive tools to solve unsteady, oscillating flows in frequency and time domains; Gain accurate knowledge of the applicability limits of various computational techniques
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Course Topics:

- Navier-Stokes Equations vs. linear acoustic theory
 - Small vs. large amplitude wave propagation in ducts
 - Flow noise (flow-acoustic coupling and flow-surface interaction)
 - Flow-acoustic coupling in flow laboratory
 - Wave reflectors and attenuators
 - Silencer performance in acoustics laboratory
 - Unsteady internal flows
 - Planar vs. multi-dimensional wave propagation in engines, combustion chambers, and compressors
 - Large amplitude pressure measurements in engine laboratory
 - Contemporary computational approaches for wave dynamics: frequency vs. time-domain techniques
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Designation:

Elective