

AE 6410 - Syllabus

Combustion Dynamics- 3 Credits

General Information

Description

Acoustic wave propagation in inhomogeneous flows, flame-acoustic wave interactions, and control of combustion-driven oscillations.

Pre- &/or Co-Requisites

AE 6766 or ME 6766

Course Goals and Learning Outcomes

- Understand the three canonical disturbances - acoustic, vortical, and entropy disturbances - how they propagate, how they interact, and their sources
- Acoustic wave propagation in inhomogeneous media and complex geometries
- Acoustic interactions with unsteady heat release
- Hydrodynamic stability theory in shear flows, including overview of linear and nonlinear characteristics of vortical structures in 2-D shear layers, jets, wakes, and cavities
- Disturbance propagation on premixed and nonpremixed flame dynamics
- Heat release response of flames to flow and thermodynamic disturbances, including flame transfer functions

Course Requirements & Grading

Note: Graded components of a course may vary with each offering. The example below is typical but subject to change.

The grade will be based upon a midterm, final exam, and two homework/projects, all equally weighted.

- Project 1: Early March (before the midterm)
- Midterm Early March (one week before drop date)
- Project 2: Late April (last day before reading period)
- Final Exam: Regularly scheduled exam date

Grading Scale

Your final grade will be assigned as a letter grade according to the following scale:

A	90-100%
B	80-89%
C	70-79%
D	60-69%
F	0-59%

Topics Covered

Note: The exact topics covered in a course may vary with each offering. The example below is typical but subject to change. The corresponding textbook chapters are noted

- Decomposition of Flow Disturbances (Ch. 1, Ch. 2)

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- Linear and Nonlinear Stability (Ch. 2)
- Linear Acoustics Overview (Ch. 5)
- Linear Acoustics - Inhomogeneity (Ch. 6)
- Linear Thermoacoustics (Ch. 6)
- Hydrodynamic Stability - Overview (Ch. 3)
- Hydrodynamic Stability - Canonical Flowfields (Ch. 4)
- Flamelet Dynamics (Ch. 11)
- Heat Release Dynamics (Ch. 12)
- Dynamic Signal Analysis (Notes on canvas)

Course Materials

Textbook

T. Lieuwen, Unsteady Combustor Physics, 2nd Edition

Course notes

Available on canvas