

- Course Number and Title: M E 536. Hydrodynamic Stability and Turbulence
- Catalog Description: Introduction to fundamentals of hydrodynamic stability, classical linear stability analysis of parallel shear flows and rotating flows, nonlinear stability, basic concepts in turbulence theory.
- Credit Hours: 3 Credits (3)
- Prerequisite(s) / Corequisite(s): Prerequisite(s): M E 533
Corequisite(s): None
- Required: Graduate Elective
- Course Availability: Spring Semester
- Instructor (Usual): Dr. Andreas Gross (See <https://mae.nmsu.edu/people/faculty.html>)
- Textbook: None
- Course Learning Objectives: After completing this course, a student should be able to:
 - 1) Obtain basic understanding of hydrodynamic instability.
 - 2) Learn about different stages of laminar turbulent breakdown.
 - 3) Obtain basic understanding of turbulence.
- Topics Covered:
 - Taylor-Couette flow, Benard convection, Reynolds pipe flow
 - Convective and absolute instability
 - Temporal and spatial instability
 - Linearized Navier-Stokes equations
 - Parallel flow assumption
 - Disturbance wave ansatz
 - Rayleigh equation
 - Orr-Sommerfeld equation
 - Tollmien-Schlichting waves
 - Squire, Rayleigh, and other theorems
 - Stages of laminar turbulent breakdown
 - Structure of turbulence
 - Kolmogorov scales
 - Energy spectral density
 - Law of the wall
 - Reynolds averaging
 - Mixing length hypothesis
 - Boussinesq eddy-viscosity approximation
 - Algebraic turbulence model