**TAM 536**
**Instability and Transition**
**Spring 2024**

**Syllabus**

Introduction
- Importance of instability and transition
- Stability of the solutions of dynamical equations

General Considerations
- Navier-Stokes equations and the multiplicity of their solutions
- Stability and transition viewed as the development of spatial and temporal complexity
- Linearization about a nominal solution, and growth/decay of infinitesimal disturbances
- "Finite-amplitude" disturbances
- "Energy methods"
- Experimental and computational methods

Shear Flows
- Shear layers and other "open" parallel and quasi-parallel flows
- Couette and Poiseuille flows in channels
- Flat-plate boundary layers
- Flows past two-dimensional and axisymmetric bluff bodies
- Jets
- Circular Couette flow
- Fluid-structure interaction

Buoyancy-driven flows
- Rayleigh-Bénard convection
- Doubly-diffusive convection
- Effects of shear

Other topics (depending on student interest)
- Marangoni instability
- Instability in electro-osmotic flows and other flows of microfluidic interest
- Instability in gas-liquid and other two-phase flows
- Rayleigh-Taylor instability
- Stability and transition for time-periodic and other unsteady flows