AST 462: Physics of Astrophysics 2: Astrophysical Fluid and Plasma Dynamics
Professor: Eric Blackman, B&L 417A, 5-0537

Texts:
A. Choudhuri: Physics of Fluids and Plasmas;
C. Clarke and R. Carswell: Astrophysical Fluid Dynamics
F. Shu, Physics of Astrophysics vol 2: Gas Dynamics (supplemental)

Course grading: course will be graded pass-fail

Course work:

1. Study class notes and text
2. Problem sets
3. Final project with a talk during exam week and a paper.

Tentative Topics Outline:

Neutral Fluids:
- Kinetic theory vs. Fluids: the big picture
- Boltzmann equation and collisions
- Transport Theory
- Moment Equations/Basic Fluid Equations
- Hydrostatic Equilibrium Limit
- Bernoulli's Principle
- Vorticity and Circulation
- Inviscid vs. Viscous Flows
- Sound Waves
- Spiral Density Waves
- Fluid Instabilities
- Shocks
- Thermal Instability
- Hydrodynamic Turbulence
- Mixing Length Theory of Convection
- Rotating Fluids
- Accretion Disks
- Outflows

Magnetohydrodynamics, Plasmas and Related Phenomena:
- Basic Plasma Physics
- Basics of MHD and relation to hydrodynamics
- Flux Freezing
- Magnetic Breaking
- MHD Outflows
- Magnetic Dynamos
- MHD Turbulence

MHD Stability
Magneto-rotational Instability and Accretion Disks