General Information of GPP II

- Contents: Magnetohydrodynamics (MHD)
- 12 weeks total and spring break in between
  - Check the course website for schedules of each week: http://w3.pppl.gov/~hji/AST552/AST552.html
- Grader: Himawan Winarto
- Midterm exam: written in mid-March
- Final exam: oral in May (mini Generals oral).
- Grade breakdown:
  - Class: 10%
  - Homework: 40%
  - Midterm exam: 20%
  - Final exam: 30%

Topics for GPP II

Topics	Comments
MHD models	Valid in large systems
Magnetostatic equilibrium	Basics for magnetic fusion plasmas
Steady flows	Basics for fluid dynamics and astro.
Waves and shocks	Basic waves, shocks common in astro.
Energy principle	Useful tool to examine stability
Instabilities	Pressure-, current-, flow-shear-driven
Self-organization and turbulence	Essential nonlinear processes
Magnetic reconnection	Magnetic field destruction
Magnetic dynamo	Magnetic field generation

Reference Books

- Gurnett & Bhattacharjee, *Introduction to Plasma Physics: With Space, Laboratory and Astrophysical Applications* 2nd Ed. (Cambridge University Press, 2017).
- Freidberg, *Ideal MHD* (Cambridge University Press, 2014).
- Wesson, *Tokamaks* 4th Ed. (Oxford University press, 2011).
- Miyamoto, *Plasma Physics for Controlled Fusion*, 2nd Ed. (Springer, 2016).
- Kulsrud, *Plasma physics for astrophysics* (Princeton University Press, 2005). [Errata]
- Kundu, (Cohen, & Dowling,) *Fluid Mechanics* (Academic Press, 1990); 6th Ed. (Academic Press, 2016)

Relevance of MHD and References

Topics	Fusion	Heliophysics & astrophysics	Liquid metals	Book
MHD models	1	1	1	F, W, K, Ku, *
Magnetostatic equilibrium	1	3	3	M, F, W, K
Steady flows	3	1	1	M, W, Ku, *
Waves and shocks	2	1	2	G, K, M, Ku
Energy principle	1	1	2	K, F, M
Instabilities	1	1	1	K, F, M, W, G, Ku, *
Self-organization and turbulence	1	1	1	K, Ku, *
Magnetic reconnection	1	1	3	K, *
Magnetic dynamo	2	1	1	K, *

1: Most relevant, 2: Somewhat relevant, 3: Least relevant. G: Gurnett, M: Miyamoto, F: Freidberg, K: Kulsrud, W: Wesson, Ku: Kundu, *: others