

University of Central Florida

PHZ 5505

PLASMA PHYSICS

SPRING 2008

This course aims at providing a theoretical discussion of the most important and representative types of plasma and phenomena that are of interest in fusion reactors and space systems and is addressed to graduate (as well as advanced undergraduate) students in applied mathematics, physics and engineering. The prerequisites are undergraduate courses: ordinary/partial differential equations (MAP 2302 and MAP 4363 or equivalent), complex variables (MAP 4307 or equivalent), mechanics (PHY 3221 or equivalent), electricity and magnetism (PHY 3323 or equivalent) or consent of instructor.

The topics for this course will be chosen from the following:

1. Basic Plasma Physical Concepts.
2. Charged Particle Orbits, Guiding-Center
3. Plasma Waves, Langmuir waves, Ion-Acoustic Waves, Waves in a Magnetized
4. Magnetohydrodynamic (MHD) Model, MHD Equilibrium and Stability, MHD Waves.
5. Plasma Kinetic Theory, Vlasov Equation, Applications.
6. Nonlinear Plasma Phenomena, Solitons.
7. Individual Research Projects.

The recommended text is:

1. P.M. Bellan: *Fundamentals of Plasma Physics*, Cambridge Univ. Press (2006). ISBN: D-521-821169.

Reference books for selected topics are:

1. P.A. Davidson: *An Introduction to Magnetohydrodynamics*, Cambridge Univ. Press, (2000).
2. B.K. Shivamoggi: *Theory of Hydromagnetic Stability*, Gordon and Breach, (1987).
3. B.K. Shivamoggi: *Introduction to Nonlinear Fluid-Plasma Waves*, Kluwer, (1988).
4. T.H. Stix: *Waves in Plasma*, Amer. Inst. Phys., (1992).

Grading Method:

Homework Assignments (70 points)

Individual Research Project (30 points)

Standard Grading Scale: (A:90-100 B: 80-89, C: 70-79 D: 60-69, F: 0-59).

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