

PHYS 472C: Advanced Topics in Physics II: Plasma Physics Syllabus Fall 2014

Instructor: Prof. Hui Zhang
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Reichardt 108 (during office hours)

Time: Tuesdays and Thursdays, 2:00pm-3:30pm (Oct 9 - Nov 6)

Place: REIC 138

Office Hours: Mondays, Wednesdays, and Fridays 12:00-1:00pm, or by appointment.

Credits: 1 credit, 3 hours/week of lecture

Useful Book:
Introduction to Plasma Physics and Controlled Fusion, Volume 1:
Plasma Physics, Francis F Chen, Plenum Press, 2nd Edition, 1984

Course Description

A plasma is a quasi-neutral ionized gas which exhibits collective behavior. The plasma state is often described as the fourth state of matter. More than 99% of the known universe is in the plasma state. A plasma behaves very differently from a normal gas. While electrically neutral particles interact with magnetic fields very weakly, charged particles interact with magnetic fields through the Lorentz force, a long-range force typically many times stronger than gravity. The objective of plasma physics is to study how ionized particles interact among themselves and with electromagnetic fields. Electromagnetic fields and charged particles obey respectively, the fundamental Maxwell equations and the Lorentz equation of motion. Our objective is to study these equations in a systematic way in order to learn how electromagnetic fields and charged particles behave, with an emphasis on understanding the various electrodynamics phenomena observed in space. This course provides an introduction to plasma physics, and its application to space physics, at the upper undergraduate level.

Grading

Class Participation	5%
Problem Sets (one every week)	60%
Final Exam (2-3:30pm on November 6, Thursday, closed book)	35%
Total	100%

> 90 %	A
85 % -- 90 %	A-
80 % -- 85 %	B+
75 % -- 80 %	B
70 % -- 75 %	B-
65 % -- 70 %	C+
60 % -- 65 %	C
55 % -- 60 %	C-
50 % -- 55 %	D+
45 % -- 50 %	D
40 % -- 45 %	D-
< 40 %	F

Course Policies

Problem sets will be given in class and are due in class on the due date stated in the problem sets. You are expected to show not only your answer but also steps leading to that answer. Your work should be clean and clear enough for me to understand.

High ethical standards are essential for maintaining credibility. Plagiarism is defined as

appropriating passages or ideas from another person's work and using them as one's own. You may work with your classmates on problem sets, however, you should submit your own work, not a copy from another source. Keep in mind that you will be required to do similar problems on your own during an exam. Plagiarism on homework or on an exam will result in a failing grade.

Students with Disabilities Notice

The University of Alaska Fairbanks is committed to equal opportunity for students with disabilities. Students with disabilities are encouraged to contact the coordinator of Disability Services (Mary Matthews) at the Center for health & Counseling (x7043). See section on "Disability Services" of the UAF Class Schedule (<http://www.uaf.edu/schedule/>).

Tentative Weekly Schedule

Week	Date	Lecture Subject	Problem Sets
6	Thursday Oct 9	Introduction (Chapter 1)	
7	Tuesday Oct 14	Single Particle Motion (Chapter 2)	
	Thursday Oct 16		Problem Set 1 is Due
8	Tuesday Oct 21	Magnetohydrodynamics (MHD) (Chapters 6.2, 6.3, and 3.4)	
	Thursday Oct 23		Problem Set 2 is Due
9	Tuesday Oct 28	Waves and Instabilities (Chapters 4 and 6.5)	
	Thursday Oct 30		Problem Set 3 is Due
10	Tuesday Nov 4	Review	
	Thursday Nov 6	2:00pm-3:30pm, Final Exam	