Contact Information

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Course Information

Lecture:	8:00–9:10 am Days 135 (Mods C+D)
Room:	319 Peter Engel Science Center
Textbook:	*Physics of Space Plasmas* by Parks
Web Site:	http://www.physics.csbsju.edu/364/

Introduction

Space Physics is the study of what goes on in the solar systems between the Sun and its satellites — the planets, moons, comets, asteroids, etc. In elementary science classes this region is often described as vacuum that contains no matter. This is an exaggeration — even though the number density of particles in most regions of the solar system is small enough to be considered a vacuum by earthbound standards, matter still exists in all regions. This matter usually exists as a plasma. Along with the plasma, many different types of waves exist in space. Much of this course will deal with the plasma and waves in space and their interactions with each other.

In some ways, Space Physics is one of the oldest branches of physics. Since before recorded history, people have been fascinated by the night sky. Much of what interested ancient people involved the stars, which would now be classified as astronomy, but some of the most striking phenomena, including most importantly the aurora borealis and australis, have their roots in Space Physics. Though Space Physics has its roots in the distant past, it did not really come into its own as a field of study until after man-made satellites were first launched into space. In-situ measurements are key to understanding the space environment and in this course we will often look at spacecraft data.

Homework Assignments

Homework will be assigned roughly once a cycle and be due roughly a cycle later.

Grading

The grade in this class will be 35 % from the total homework grade, 15 % from quizzes/participation, 17.5 % from the first test grade, and 32.5 % from the final test.

Course Schedule

Cycle		Date	Sections	Title	Topics
7-1	T	3/13	1.1–1.10	Introduction	Particles, fields and structures in space
7-3	F	3/16	2.1–5, 2.8–9	Basic Plasma Physics	Fields and statistical mechanics
7-5	T	3/20	3.1–6	Fields 1	Magnetic fields in space
8-1	R	3/22	3.7–10	Fields 2	Electric fields in space
8-3	M	3/26	4.1–10	Particles 1	Equations of motion and drifts
8-5	W	3/28	4.11–16	Particles 2	Adiabatic invariants and trapped particles
9-1	F	3/30	5.1–3, 5.5–6	MHD 1	Fluids; single particle and ideal
9-3	T	4/03	5.9–11	MHD 2	Maxwellian MHD
				Easter Break	
9-5	T	4/10	1–5	Review	Review for Test 1
10-1	R	4/12	1–5	Test 1	
10-3	M	4/16	6.1–2, supplemental	Atmospheres	Earth’s and Sun’s atmospheres
10-5	W	4/18	6.4–10	Solar wind	Causes and models of the solar wind
11-1	F	4/20	8.1 – 5	Boundaries 1	Basic types and models
11-3	T	4/24	8.6–9	Boundaries 2	Applied boundaries and boundary layers
11-5	R	4/26	7.1–2, 7.7	Currents	Currents in space, field-aligned currents
12-1	M	4/30	supplemental	Aurora	Causes and structure of aurora
12-3	W	5/02	11.1–4, 11.6–9	Instabiliies	Instabilities in space and Space Weather
12-5	F	5/04	21–33.7	Review	Review for Final

References

- *Introduction to Space Physics* edited by Kivelson and Russell — at a similar level to Parks, but orgranized by space physics structures and regions instead of by plasma physics topic as Parks does.
- *Introduction to Plasma Physics* by Chen — classic plasma physics book with examples focused on lab plasmas.
- *Basic Space Plasma Physics* by Baumjohann and Treuman — divides things by plasma topics like parks, but orders them differently.
- *Space Physics* by Kalleronde — tries an approach somewhere between Parks and K&R. It starts with quite a bit of theory, then moves through regions of space.