

## Lecture plan for the Space Physics course, Sep-Oct 2013

Updated  
130916

Literature:

R = Rönmark, *Lecture notes on Space Physics from the Sun to the Aurora*

U = Umeå universitet, *Rymdteknikens grunder: Raketer och satelliter (optional)*

P = Eriksson, *Plasmas and Magnetic Fields in the Solar System*

E = Eriksson, *Space Physics Lecture Notes*

Numbers in the "read" column refer to chapters. **Boldface** indicates matter you should read, the rest is more optional. The Tascione book can be omitted entirely. **Examlets** refer to a set of small partial exams: see separate information. Expect updates to the schedule and plan!

Lecturers: AE = Anders Eriksson, MH = Mika Holmberg

Lecture		Content	Read
1	3/9	AE MH	Solar system space environments. Space physics. Course goals. Last year's course evaluation results.
2	5/9	AE	Plasmas. Ionization and recombination. Particle and fluid models of plasmas. Quasi-neutrality, Debye screening.
3	6/9	AE	The sun, the solar wind. Magnetostatic fields.
4	9/9	AE	Planetary magnetic fields, dipole fields, field lines. Field transformations. Frozen-in magnetic fields.
5	10/9	AE	Interplanetary magnetic field. Magnetohydrodynamics, magnetic pressure and tension, energy densities.
6	16/9	AE	Problem session: P6, P12, P14, P15, P17
7	19/9	MH	<b>Examlet #1.</b> Structure formation. Dynamos. Planetary magnetic fields.
8	23/9	MH	Magnetospheres. Shocks, the heliopause. Boundaries in space. Magnetosphere currents.
9	25/9	MH	Particle picture of magnetopause current. Magnetopause pressure balance. Gyro motion. Drift motion, ExB drift.
10	27/9	MH	General force drift, grad B. Adiabatic invariance, magnetic mirroring, pitch angle. Motion in dipole fields. Mid-course evaluation.
11	1/10	MH	Convection fields, corotation, the plasmasphere, radiation belts.
12	3/10	MH	Problem session: P20, P24, P34, P9, P28
13	7/10	AE	<b>Examlet #2.</b> Rockets and launches. Trajectories in central fields. Kepler orbits.
14	8/10	AE	Geostationary and geosynchronous orbits. Non-ideal effects. Transfer orbits, interplanetary orbits. Spacecraft subsystems and requirements. Thermal balance.
15	9/10	AE	Problem session: P48, P52, P55
16	10/10	MH	<b>Examlet #3.</b> Neutral atmospheres, hydrostatic equilibrium. Ionization and recombination, formation of ionospheres. Ionospheric conductivity.
17	15/10	MH	Magnetosphere-ionosphere coupling, Birkeland currents, aurora, substorms.
18	16/10	MH	Solar activity. Geomagnetic storms, space weather.
19	17/10	MH	Problem session. P37, P38, old exams
20	18/10	MH	<b>Examlet #4.</b> Visit to IRF Uppsala.
21	21/10	AE	Problem session. Course evaluation.
EXAM 23/10		Final written exam, 5 hours	