FEF3310 Waves in Space Plasmas, Advanced Course 8.0 credits

Vågor i rymdplasma, avancerad kurs

This is a translation of the Swedish, legally binding, course syllabus.

If the course is discontinued, students may request to be examined during the following two academic years

Establishment

Course syllabus for FEF3310 valid from Autumn 2011

Grading scale

Education cycle

Third cycle

Specific prerequisites

EF2200 Plasma Physics, ED2210 Electromagnetic Waves in Dispersive Media, or equivalent knowledge.

Language of instruction

The language of instruction is specified in the course offering information in the course catalogue.

Intended learning outcomes

After completed course the students should be able to:

· Describe the most common wave modes observed in space plasmas, including their observational characteristics and theoretical treatment.

· Discuss the phase and group velocity of the waves in three dimensions, applied to the waves in the near-Earth space

· Describe the phenomenon of resonance cones and their occurrence in space plasmas

· Describe observational properties of the ULF waves in the magnetosphere and discuss theoretical interpretation in terms of field line resonance

· Discuss the propagation characteristics of the whistler waves

· Describe auroral plasma waves such as auroral kilometric radiation, VLF waves

· Discuss the most common instabilities in space plasmas

Course contents

Waves in cold plasmas: CMA diagram, dispersion surfaces, propagation at arbitrary angle: phase and group velocity in 3D. Resonance cones. Boundary waves. Waves in inhomogeneous plasmas: WKB method, mode conversion, ray tracing, drift waves.

ULF waves in the magnetosphere: field line resonances. Dispersive Alfven waves. Whistlers in the inner magnetosphere: observations, theory. Auroral plasma waves: auroral kilometric radiation, VLF waves. Instabilities in space plasmas.

Disposition

Discussion meetings.

Course literature

Plasma Waves, D.G. Swanson, Academic Press, Inc., 1989.

Plasma Waves in the Magnetosphere, A.D.M. Walker, Springer Verlag, 1993.

Theory of Space Plasma Microinstabilities, S.P. Gary, Cambridge University Press, 1993.

Auroral Plasma Physics, G. Paschmann, S. Halland, 2002.

and selected journal papers

Examination

Based on recommendation from KTH’s coordinator for disabilities, the examiner will decide how to adapt an examination for students with documented disability.

The examiner may apply another examination format when re-examining individual students.

Other requirements for final grade

Final oral exam.

Ethical approach

- All members of a group are responsible for the group's work.
- In any assessment, every student shall honestly disclose any help received and sources used.
- In an oral assessment, every student shall be able to present and answer questions about the entire assignment and solution.