



FED3240 Plasma Waves I 8.0 credits

Plasmavågor I

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 FED3240 valid from Spring 2012

Grading scale

Education cycle

Third cycle

Specific prerequisites

Language of instruction

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

Intended learning outcomes

To provide the theoretical basis for waves appearing in plasmas, including their propagation and absorption. When completing the course, the student should be able to

- Derive the dispersion relation for waves in cold plasmas

- Characterize the most common cold plasma waves
- Be familiar with the CMA diagram
- Solve wave equation in a planar geometry with WKB
- Describe how to treat the plasma response and basic properties of the response tensor
- Describe how to calculate wave propagation with the ray tracing method
- Describe the collisionless absorption mechanisms in a plasma
- Describe how the emission and absorption processes are related

Course contents

Plasma waves and some kinetic theory. Waves in cold plasmas. Cold dielectric tensor. Oscillations in a bounded plasma. Ray tracing. Reflection, absorption and emission processes. Collisionless absorption mechanisms: Landau damping, cyclotron damping and TTMP damping. Kramers-Kronig's and Onsager's relations. Emission of waves. Larmor formula.

Disposition

Seminars or discussion meetings.

Course literature

Lecture notes

Parts of the following, or similar, literature: T.H. Stix, *Waves in Plasmas*, American Institute of Physics, New York, 1992. Chapters 1-4, 11

D.B. Melrose and R. C. McPhedran, *Electromagnetic Processes in Dispersive Media*, Cambridge University Press 1991. Chapters 6-7, 11, 15-16, 18.

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

Assignments, written and final oral examination.

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.