ED2220 Experimentell fusion-splasmafysik 6,0 hp

Experimental Fusion Plasma Physics

När kurs inte längre ges har student möjlighet att examineras under ytterligare två läsår.

Fastställande

Kursplan för ED2220 gäller från och med HT09

Betygsskala

A, B, C, D, E, FX, F

Utbildningsnivå

Avancerad nivå

Huvudområden

Elektroteknik,Fysik,Teknisk fysik

Särskild behörighet

Minimum 120 hp in electrical or physical engineering.

Completed upper secondary education including documented proficiency in English corresponding to English B. For students who received/will receive their final school grades after 31 December 2009, there is an additional entry requirement for mathematics as follows: documented proficiency in mathematics corresponding to Mathematics A.

Undervisningsspråk

Undervisningsspråk anges i kurstillfällesinformationen i kurs- och programkatalogen.

Lärandemål

The purpose of this course is to make the student familiar with basic experimental and diagnostic techniques used in magnetic confinement fusion plasma physics research. The student will learn about techniques for generation of high temperature toroidal fusion plasmas and be able to understand the physics underlying the common fusion plasma diagnostics methods. Experimental techniques for generation of fusion plasmas will be exemplified by studying the systems at the EXTRAP T2R reversed field pinch device at KTH. In addition, the student will gain practical experience of using some diagnostics that are available at EXTRAP T2R and analyzing real measurement data. Physics concepts underlying the plasma diagnostic methods will be introduced and discussed during lectures, using a systematic approach from first principles. A number of plasma diagnostic applications will be introduced in more detail.

After passing the course, the student should be able to

- describe experimental techniques for generation of high temperature toroidal fusion plasmas,
- formulate the underlying physics principles for common plasma diagnostic methods,
- estimate measurement errors in plasma diagnostic data,
- explain the technical features of some commonly used basic plasma diagnostic applications,
- demonstrate the practical usage of some selected plasma diagnostics that are available at EXTRAP T2R,
- write simple computer codes for acquiring, analyzing and plotting data from some selected plasma diagnostics using commercial software packages (IDL, MATLAB),
- perform certain common data analysis tasks, such as Fourier transform and signal filtering using available software routines,

present analyzed data in graphic form in short reports, that includes written material that describes the diagnostic setup and the data analysis methods used.

Kursinnehåll

Experimental techniques for generation of high temperature toroidal fusion plasmas, including vacuum technology, magnets, energy storage, plasma control methods and data acquisition. Underlying principles for common plasma diagnostic methods such as magnetic measurements, measurements of plasma particle flux, measurements of plasma refractive index, electromagnetic emission by free electrons, electromagnetic radiation from bound electrons, scattering of electromagnetic radiation, measurements of ion processes. Practical usage of some basic plasma diagnostic applications. The selection of diagnostic applications is based on the systems available at EXTRAP T2R, and includes magnetic diagnostics, interferometer, Thomson scattering, spectrometers, bolometers, SXR camera, and electric probes.

Kurslitteratur

Experimental Fusion Plasma Physics, Per Brunsell, KTH, 2007

Examination

- INL1 - Inlämningsuppgift, 6,0 hp, betygsskala: A, B, C, D, E, FX, F

Examinator beslutar, baserat på rekommendation från KTH:s handläggare av stöd till studenter med funktionsnedsättning, om eventuell anpassad examination för studenter med dokumenterad, varaktig funktionsnedsättning.

Examinator får medge annan examinationsform vid omexamination av enstaka studenter.

Övriga krav för slutbetyg

Individual home assignments will be given that exemplify the theory. Group assignments will be given that require the students to use diagnostics and analyze data to obtain specific information, e. g. electron temperature and density, radial radiation profiles, or plasma fluctuation characteristics. Course credits will be given for completed individual and group assignments.

Etiskt förhållningssätt

- Vid grupparbete har alla i gruppen ansvar för gruppens arbete.
- Vid examination ska varje student ärligt redovisa hjälp som erhållits och källor som använts.
- Vid muntlig examination ska varje student kunna redogöra för hela uppgiften och hela lösningen.