EF2270 Teknisk plasmafysik 6,0 hp

Applied Plasma Physics

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

Fastställande

Kursplan för EF2270 gäller från och med HT09

Betygsskala

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

Utbildningsnivå

Avancerad nivå

Huvudområden

Elektroteknik,Fysik,Teknisk fysik

Särskild behörighet

Undervisningsspråk

Undervisningsspråk anges i kurstillfällesinformationen i kurs- och programkatalogen.

Lärandemål

The goal of the course is to make the student familiar with a broad range of technical plasma devices, and able to analyze and describe their main plasma physical characteristics and principles of operation. After the course the student shall be able to:

- Describe the plasma physical processes, and characterizing parameters, that are listed in the course content.
- Explain the functioning, with focus on the dominating plasma physical processes, of the six discharge types that are listed in the course content.
- Describe the technical applications of plasma processing that are listed in the course content, and explain how the discharge types' characteristic parameters are related to the desired use of the devices.

For the highest grade the student shall be able to apply the knowledge also to analyze and characterize other discharge types than those treated in the course.

Kursinnehåll

Instead of treating the whole, very wide field, of industrial plasma discharge types, the course focuses on six discharge types that have been selected so that they together exemplify most of the knowledge basis in applied plasma physics. For each discharge type the focus is on the plasma processes that determine its characteristics, and one or two examples of industrial applications are treated.

- Plasma physical processes: electron influx from surfaces by ion impact, thermal emission, field emission, cathode spots and corona emission. The balance of electron energy, both in ac and dc discharges. Plasma gain by ionization, and plasma loss by diffusion, recombination, and current losses. The self-bias process. Electron avalanches and streamers.
- Characterizing parameters: collisionality, degree of ionization, degree of magnetization (for ions and for electrons). Scale lengths: gyro radii, mean free paths for elastic collisions and for ionization, and sheath thicknesses. The Hall, Pedersen, and parallel conductivities.
- Discharge types: DC glow discharges, arc discharges, barrier discharges, corona discharges, sputtering magnetrons, and RF discharges.
- Technical applications: Plasma etching and deposition in the microelectronics industry. Ion implantation. Medical sterilization. Electrostatic dust collectors. Plasma waste treatment. Plasma spray deposition. Plasma rocket propulsion. Plasma-chemical ozone production.

Kurslitteratur

To be communicated at the course start.

Examination

- TEN1 - Examination, 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

Written examination.

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.