SH2203 Experimentell partikelfysik 7,5 hp

Experimental Particle Physics

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

Fastställande

Kursplan för SH2203 gäller från och med VT11

Betygsskala

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

Utbildningsnivå

Avancerad nivå

Huvudområden

Fysik

Särskild behörighet

Subatomic Physics (SH2103) or similar.

Undervisningsspråk

Undervisningsspråk anges i kurstillfällesinformationen i kurs- och programkatalogen.

Lärandemål

Particle physics probes the structure and interactions of matter at the smallest possible distances. The aim of this course is to give a non-mathematical but complete introduction to the concepts of particle physics with particular emphasis is placed on the experimental techniques used to extract information about the subatomic world. After completing this course, you should be able to:

- Classify the fundamental subatomic particles by their possible interactions.
- Use Feynman diagrams and conservation rules to analyse interactions qualitatively.
- Identify the key features of the interactions and synthesise these to describe the Standard Model of particle physics.
- Explain how particles can be detected and their properties determined by exploiting their interactions with matter. Demonstrate the limitations of different detection techniques.
- Develop particle detection systems by combining detection methods.
- Combine your theoretical knowledge of particle interactions with your more practical knowledge of detection techniques to understand the construction of contemporary experiments.
- Perform dimensional analysis to investigate physical relationships in particle physics
- Interpret data from figures published in the scientific literature and use this to perform calculations and develop conclusions.
- Reflect on the current 'open questions' in particle physics and the experiments planned to address these issues.
- Select and critically research a particle physics sub-topic of your choice and present your work to other members of the class during the student seminar day.

Kursinnehåll

The course discusses the smallest constituents of matter and their interactions. The main focus is on the experimental and phenomeological aspects. The content covers:

- Matter and interaction particles.

- The electromagnetic, charged and neutral current weak and strong interactions .

- Gauge symmetries and conservation rules.

- The production and acceleration of particles in the laboratory.

- Interaction of particles with matter.

- Single particle detectors, particle shower detectors and detector systems.

- Electron-positron collisions.

- Proton-(anti-)proton collisions. Electron-proton and heavy ion colliders.

- Non-accelerator particle physics and the link to cosmology.

- Particle physics in the future - beyond the Standard Model.

The course contains one laboratory exercise.

Kursupplägg

Home assignements (5 hp)

Seminar (1.5 hp)

Laboratory exercise (1hp)

Kurslitteratur

To be defined before the start of course.

Examination

- INL1 - Inlämningsuppgifter, 5,0 hp, betygsskala: A, B, C, D, E, FX, F
- LAB1 - Laboration, 1,0 hp, betygsskala: P, F
- PRO1 - Seminarieuppgift, 1,5 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.

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.