LUND UNIVERSITY

Faculty of Science

FYST47, Physics: Intensive Course in Computational Atomic Physics, 7.5 credits

Fysik: Intensivkurs i beräkningsatomfysik, 7,5 högskolepoäng

Second Cycle / Avancerad nivå

Details of approval

The syllabus was approved by Study programmes board, Faculty of Science on 2011-10-03 to be valid from 2011-09-01, autumn semester 2011.

General Information

The course is an elective course for second cycle studies for a scientific candidate- or Master's degree (120 credits) in physics.

Language of instruction: English

Main field of studies	*Depth of study relative to the degree requirements*
Physics	A1F, Second cycle, has second-cycle course/s as entry requirements

Learning outcomes

The aim of the course is that students should have acquired the following knowledge and skills on completion of the course:

Knowledge and understanding

To pass the course, the student should

- demonstrate an understanding of modelling of atomic systems with modern computational methods
- demonstrate an understanding of computational methods within atomic physics
- demonstrate an understanding of important theoretical concepts such as correlation, radiative transitions, resonanses in photoionization and collisional cross sections.

- be able to discuss applications of computational atomic physics within for example astrophysics and fusion research
- be able to describe the role of atomic physics in examining fundamental models for e.g. parity violation and properties of the atomic nucleus

Competence and skills

To pass the course, the student should

- be able to carry out calculations with state-of-the-art methods, e.g. multiconfigurations and R-matrix calculations
- be able to present results of calculations in a systematic way

Judgement and approach

To pass the course, the student should

- demonstrate an understanding of computations importance for atomic physics and its applications

Course content

Atomic structure- central field, correlation, relativistic effects, radiative transitions, Hartree-Fock and Dirac-Fock-metoder, Z-dependent theory. Atomic processes- the close-coupling model, the R-matrixmethod, Photoionization, elektron-ion-collisions, resonanses. Applications of atomic physics within for example astrophysics, fusion research or fluorescent light research.

Course design

The teaching consists of lectures and computer exercises. As an intensive course it is built-up around two weeks of full-time studies followed by three weeks work with a project.

Assessment

Examination takes place through oral and written presentation of computational exercises after the first two the weeks and a written report of the project work.

Students who do not pass the regular exam are offered a new possibility shortly after the regular exam.

Subcourses that are part of this course can be found in an appendix at the end of this document.

Grades

Marking scale: Fail, Pass, Pass with distinction.
To pass the entire course, passed presentation of assignments is required, at least 80% attendance on lectures/exercises under the two first weeks and passed project work.

The final grade is decided by results of the project work.

Entry requirements

For admission to the course, FYSA31, Physics 3 is required: Modern physics 30 credits or the equivalent, and English B. Knowledge equivalent to FYSN17, Quantum Mechanics 7.5 credits be recommended.

Subcourses in FYST47, Physics: Intensive Course in Computational Atomic Physics

Applies from H11

1101 Intensive Course in Computational Atomic Physics, 7,5 hp
Grading scale: Fail, Pass, Pass with distinction