



Course syllabus

Faculty of Technology

Department of Physics and Electrical Engineering

1FY801 Atom- och kärnfysik, 7,5 högskolepoäng

Atomic and Nuclear Physics, 7.5 credits

Main field of study

Physics

Subject Group

Physics

Level of classification

First Level

Progression

G1N

Date of Ratification

Approved 2009-12-01

Revised 2014-06-16 by Faculty of Technology. Objectives, content and literature list are revised.

The course syllabus is valid from autumn semester 2014

Prerequisites

General entry requirements and Mathematics 3c, Physics 2 or Mathematics D, Physics B (Field-specific entry requirements 8/A8).

Objectives

The students are expected:

- to have the basic knowledge and concept understanding in atomic and nuclear physics and a foundation for continued studies in physics
- to interpret the atomic and nuclear quantities in terms of laws and principles
- to appreciate the application of the concepts and theories to real life problems
- basic knowledge in experimental method and planning of experiments in the area
- to show ability to analyse data, error estimation, simple regression analysis, basic statistical distributions
- to understand the meaning of measurement and observation and the different roles theory and experiment has in physics
- basic skill in problem solving using mathematical tools and computer simulation
- to have trained her ability in collaborative work and ability in written and oral communication.

Content

The course content is:

- Atom physics: light quanta, black body radiation, greenhouse effect, photoelectric effect, Compton effect, duality principle, wave nature of matter, Bohr atomic model, de Broglie hypothesis, Heisenberg' uncertainty principle, Pauli exclusion principle, quantization of atomic hydrogen, spin, many electron systems, the periodic table, x ray spectrum, molecular bonds, bonding and energy levels of solids
- Nuclear physics: properties of nuclei, nuclear binding and nuclear structure, radioactivity and decay law, the half-life, decay series, detectors, nuclear reactions, fission, fusion, radiation exchange with matter, dosimetry, and introduction in elementary particle physics
- Relativity theory: the concept of relativity, time dilation, length contraction, relativistic mass, energy and momentum.

Type of Instruction

Lectures, group assignments and concept related laboratory work. The laboratory work is obligatory.

Examination

The course is assessed with the grades Fail (U), Pass (G) or Pass with Distinction (VG).

The examination may be given in writings or orally and consists of theoretical questions or problems to solve. The type of assessment used in the course will be decided on at the beginning of the course. The student has to write reports on laboratory work carried out.

Students' who do not pass the regular examination are given the opportunity to do a resit examination shortly after the regular examination.

On request, students may have their credits translated to ECTS-marks. Such a request must be sent to the examiner before the grading process starts.

Course Evaluation

A written course evaluation will be carried out at the end of the course in accordance with the guidelines of the University. The course evaluation will be filed at the department.

Other

Upon request, a Swedish University course certificate will be awarded upon successful completion of the course.

Required Reading and Additional Study Material

Required reading

Jönsson G & Nilsson E, *Tillämpad atomfysik*, Teach Support, 2005. Pages 350 (350).

Climate change, The physical science basis, rapport från International Panel on Climate Change (IPCC), latest version

Review articles on Nuclear technology

Alternative literature

Benson, H, *University Physics*, John Wiley & Sons, 1996. Pages 134 (942).

Hewitt, P G, *Conceptual Physics*, Addison-Wesley, 2003. Pages 70 (740).