Linnæus University

Jnr: 2018/1229-3.1.2.2

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 2018-04-23 by Faculty of Technology. Removal of ECTS-grading scale and course evaluation is changed.
The course syllabus is valid from autumn semester 2018

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.

Course Evaluation
During the course or in close connection to the course, a course evaluation is to be carried out. The result and analysis of the course evaluation are to be communicated to the students who have taken the course and to the students who are to participate in the course the next time it is offered. The course evaluation is carried out anonymously. The compiled report will be filed.

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).