



## Course syllabus

Faculty of Technology

Department of Physics and Electrical Engineering

1FY801 Atom- och kärnfysik, 7,5 högskolepoäng

1FY801 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 2020-01-13 by Faculty of Technology. Assessment methods are revised.

The course syllabus is valid from autumn semester 2020

### **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's 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.

Repeat examination is offered in accordance with Local regulations for courses and examination at the first and second-cycle level at Linnaeus University.

If the university has decided that a student is entitled to special pedagogical support due to a disability, the examiner has the right to give a customised exam or to have the student conduct the exam in an alternative way.

## Course Evaluation

During the implementation of the course or in close conjunction with the course, a course evaluation is to be carried out. Results and analysis of the course evaluation are to be promptly presented as feedback to the students who have completed the course. Students who participate during the next course instance receive feedback at the start of the course. The course evaluation is to be carried out anonymously.

## 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).

