



# FSH3311 Theoretical Nuclear Physics 7.5 credits

## Teoretisk kärnfysik

This is a translation of the Swedish, legally binding, course syllabus.

If the course is discontinued, students may request to be examined during the following two academic years

## Establishment

Course syllabus for FSH3311 valid from Spring 2019

## Grading scale

P, F

## Education cycle

Third cycle

## Specific prerequisites

Phd student.

## Language of instruction

The language of instruction is specified in the course offering information in the course catalogue.

## Intended learning outcomes

The main aim of the course is to understand the basic concepts of nuclear theory and to learn details of the mechanisms that govern the structure and decay properties of atomic nuclei from a microscopic viewpoint. To achieve this the students will be provided with the tools needed to perform basic nuclear structure model calculations. The students will thus be brought in contact with contemporary nuclear structure studies. Finally the students will be able to analyze and evaluate properties associated to complex nuclear systems by applying appropriate simple models.

## Course contents

- Nuclear force and second quantization
- fundamental coupling schemes
- Basic excitations in atomic nuclei and collectivity
- Nuclear deformation
- Magnetic resonances and medical applications
- Normal product and the Wick theorem
- Tamm-Dankoff & Random Phase Approximations
- Nuclear shell model, seniority and computation
- Fission, fusion and nuclear energy
- Nuclear astrophysics and nucleosynthesis

## Course literature

K.L.G Heyde, The nuclear shell model, Springer-Verlag 1994

## Examination

- HEM1 - Home assignments, 6.0 credits, grading scale: P, F
- PRO1 - Project, 1.5 credits, grading scale: P, F

Based on recommendation from KTH's coordinator for disabilities, the examiner will decide how to adapt an examination for students with documented disability.

The examiner may apply another examination format when re-examining individual students.

There will be no written exam. Nine homework assignments will be distributed during the course. To pass the course, it is necessary to solve at least five of them. Students may also be required to attend a seminar or take an oral exam to show that they have a good understanding of the course content.

## Other requirements for final grade

Approved grade of at least five out of nine home assignments

## Ethical approach

- All members of a group are responsible for the group's work.
- In any assessment, every student shall honestly disclose any help received and sources used.
- In an oral assessment, every student shall be able to present and answer questions about the entire assignment and solution.