SH2600 Nuclear Reactor Physics, Major Course 9.0 credits

Reaktorfysik, större kurs

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

Establishment

The course syllabus is valid from autumn 2025 according to the decision of the head of undergraduate education: HS-2025-0707 Decision date: 2025-04-08

Grading scale

A, B, C, D, E, FX, F

Education cycle

Second cycle

Main field of study

Physics, Engineering Physics

Specific prerequisites

The course requires Bachelor level knowledge of mathematics and physics from an engineering Bachelor programme. Fundamentals of basic nuclear physics and quantum mechanics are desirable but not formally requitred.

English B / English 6

Language of instruction

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

Intended learning outcomes

After completing the course, the student should be able to:

- describe the interaction of neutrons with matter,
- derive and solve the equations of radioactive decay,
- explain the mechanism of the nuclear fission chain reaction,
- describe and evaluate neutron slowing-down processes,
- derive and solve equations for neutron diffusion in fissile media,
- explain temperature feedbacks,
- describe the kinetic and dynamic behaviour of a nuclear reactor,
- explain the basic principles of reactor stability,
- describe the main types of nuclear reactors and nuclear fuels.

Course contents

The course provides an introduction to the following topics in reactor physics:

- fundamentals of nuclear physics relevant to nuclear engineering,
- interaction of radiation with matter,
- neutron thermalisation,
- nuclear fission and chain reaction,
- nuclear fuel,
- types of nuclear reactors,
- neutron diffusion equation,
- reactor theory,
- reactor kinetics,
- reactor dynamics.

The course includes in-house labs (based on a reactor simulator) and hands-on training on a reactor abroad (the VR-1 reactor in Prague).

Examination

- TENA - Examination, 5.0 credits, grading scale: A, B, C, D, E, FX, F

- LABA - Laboratory Work, 4.0 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.

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

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.