SH2601 Reactor Physics, Minor Course 6.0 credits

Reaktorfysik, mindre kurs

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 SH2601 valid from Autumn 2008

Grading scale

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

Education cycle

Second cycle

Main field of study

Engineering Physics,Physics

Language of instruction

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

Intended learning outcomes

The aim of this course is to give basic and advanced knowledge in modern reactor physics. The main part of the course is devoted to diffusion transport theory — theory of nuclear fission and their industrial applications (power generation). The lectures give also an insight into new ideas to transmute nuclear wastes with help of particle accelerators. A historical survey of the milestones of nuclear physics since 1900 is also given in an introduction to the lectures. The course gives also some practical understanding of reactor operation through the laboratory exercises conducted at the deparmental reactor simulator and probably at a research reactor.

Course contents

Being a core discipline in nuclear engineering, the course focuses on fundamental concepts in reactor physics as well as basic physical processes that determine operation of nuclear reactors and some other related subjects. The course gives a gentle introduction to the following topics:

- Nuclear fission and chain reaction;
- Neutron thermalisation;
- Neutron diffusion equation;
- Reactor kinetics and reactor dynamics;
- Monte Carlo methods;
- Nuclear fuel cycle and nuclear waste management;
- Reactor types and future Generation IV reactors;
- Accelerator Driven Systems and transmutation;
- Basic principles and modern issues of nuclear power safety.

Specific prerequisites

Recommended prerequisites: The course relies on basic university knowledge of mathematics and physics. Fundamentals of nuclear physics and quantum mechanics are desirable but not necessary. Familiarity with MATLAB is very helpful.

Course literature

- A multimedia textbook on CD.
- Web-based manuals for laboratory exercises.
- Web-based lecture presentations.
- Reference text book: D.J. Bennet & J.R. Thomson "The Elements of Nuclear Power" Longman Scientific & Technical, 1989.
- Alternative text book: J.R. Lamarsh and A.J. Baratta, “Introduction to Nuclear Engineering,” Prentice Hall, 2001.
- Alternative text book: W.N. Stacey “Nuclear Reactor Physics” Wiley, 2001

Examination

- LAB1 - Laboratory Work, 3.0 credits, grading scale: P, F
- TENA - Examination, 3.0 credits, grading scale: A, B, C, D, E, FX, 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.

Other requirements for final grade

To pass the course students are supposed to submit four written laboratory reports and pass the final written examination. The final grading may be improved by passing through a mid-term written examination (4 university credits) and/or orally presenting one out of four laboratory exercises (2 university credits).

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.