



SH2773 Nuclear Power Safety

6.0 credits

Kärnkraftsäkerhet

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 SH2773 valid from Autumn 2007

Grading scale

P, F

Education cycle

Second cycle

Main field of study

Engineering Physics, Physics

Specific prerequisites

Recommended prerequisites: Completed course(s) in Nuclear Reactor Engineering.

Language of instruction

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

Intended learning outcomes

Nuclear Power Safety (NPS) is paramount to both economic performance and public acceptance of nuclear power. The ultimate mission of NPS is to ensure that release of radioactive materials from nuclear power plants and its effect on plant personnel, public health and environment is as low as reasonably achievable. Technical content of NPS addresses both the Probability and Consequences of such radioactive releases from the plant under normal, abnormal and accident conditions, including hypothetical accidents. The NPS course aims to provide students with basics the need to be able to address questions: What are possible accidents? How do they occur? How often they occur? What are consequences?

After the course you shall possess a basic understanding of principles, issues and tools in nuclear power safety. This objective is achieved if you show that you are able to:

- Define safety requirements to be achieved in design, construction and operation of a nuclear power plant,
- Identify key milestones in accident progression scenarios (from design-basis accidents to severe core-melt accidents) and define respective prevention and mitigation measures,
- Perform a scoping assessment of a perceived threat against a plant safety barrier using contemporary knowledge and methods in safety analysis.

Course contents

The course addresses both fundamentals of safety design and methods for safety analysis of nuclear power plants, with emphasis on Light Water Reactors. Topics covered include

- safety characterization and safety features of nuclear power plants
- reactor safety principles and criteria
- design-basis and beyond-design-basis events
- accident phenomena, including severe accidents
- safety systems, containment performance
- deterministic safety analysis (basic elements)
- accident modeling simulation codes
- probabilistic safety analysis (basic elements)
- analysis of operation transients, accidents and severe accidents.
- emergency operation procedure, accident management
- safety issues and safety issue resolution
- operating experience, regulation and safety culture

Course literature

1. Lecture Materials and Complementary Course Notes
2. B. Pershagen, Light Water Reactor Safety, Pergamon Press, 1989

3. Manuals for computer codes for accident analysis
4. Scientific papers and technical reports on selected topics of plant safety

Examination

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 you should attend lectures and seminars, and fulfill the course assignments. The course assignments will be evaluated by the teacher. For the project course, you will present and defend your work (a safety analysis case) in seminars. The final examination constitutes of a written exam and an individual discussion with the teacher.

Lecture and seminar attendances – 2 univ. cr

First assignment – 1 univ. cr

Second assignment (project) – 2 univ. cr

Final exam – 1 univ. cr

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.