SH2612 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 SH2612 valid from Spring 2020

Grading scale

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

Education cycle

Second cycle

Main field of study

Engineering Physics

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 contents of NPS address both the Probability and Consequences of such radioactive releases from a nuclear power plant under normal, abnormal and accident conditions.

The NPS course aims to provide students with the knowledge to be able to address questions: What are possible accidents? How do they occur? How often they occur? What are the 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 of safety analysis for 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, including severe accidents
- accident phenomena
- safety systems and containment performance
- deterministic safety analysis (basic elements)
- accident modeling and simulation codes
- probabilistic safety analysis (basic elements)
- analysis of operational transients and accidents
- emergency operation procedure and accident management
- safety issues and their resolution
- applications of passive safety in new reactor designs
- operating experience, regulation and safety culture

Specific prerequisites

At least 120 credits in engineering and natural sciences and knowledge of English B or equivalent.
Recommended Prerequisites: Completed course (s) in nuclear reactor technology.

Course literature

1. Lecture Materials and Complementary Course Notes

2. B. Pershagen, Light Water Reactor Safety, Pergamon Press, 1989

3. B.R. Sehgal, Nuclear Safety of Light Water Reactors: Severe Accident Phenomenology, Academic Press, Elsevier, 2012

4. Manuals for computer codes for accident analysis

5. Scientific papers and technical reports on selected topics of plant safety

Examination

- HEM1 - Home Assignment, 1.0 credits, grading scale: P, F
- PRO1 - Projekt, 2.0 credits, grading scale: P, F
- TEN1 - Written exam, 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.

The examiner, in consultation with the KTH Disability Coordinator (Funka), decides on any adapted examination for students with documented permanent impairment. The examiner may grant another examination form for reexamination of single students.

Other requirements for final grade

To pass the course, the required homework assignment, project and written exam are required.
For the course project, you present and defend your work (eg a safety assessment case) in seminars.

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.