SH2705 Compact Reactor Simulator- Exercises in Reactor Kinetics and Dynamics 6.0 credits

Kompakt reaktorsimulator- övningar i reaktorkinetik och reaktordynamik

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

Establishment

Course syllabus for SH2705 valid from Autumn 2012

Grading scale

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

Education cycle

Second cycle

Main field of study

Engineering Physics

Specific prerequisites

Courses in reactor physics (SH2600, or equivalent) and reactor power engineering/nuclear reactor technology (SH2702, or equivalent)

Language of instruction

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

Intended learning outcomes

KTH operates a unique Compact Reactor Simulator - a simulator of a real Boiling Water Reactor at Forsmark, the Forsmark 3 reactor. The operator control panel of the simulator is modelled of the real control room at Forsmark 3. The simulator enables a large number of initial conditions of the reactor system to be set-up and then dynamically develop reactor responses to operators actions. Consequently the students can dynamically interact with the reactor and analyze the output from the reactor control system in real-time. The simulations can address various topics, such as the power/circulation state diagram, scram conditionsm and control rod operation. The physics of the reactor can be very pedagogically studied, e.g. reactivity, criticality, void, and xenon build-up. Safety aspects of the reactor system can also be simulated.

After completed course the student:

- will be able to give an account for the basic underlying physics of nuclear reactors, in particular reactor kinetics, reactor dynamicsm and thermal hydrulic feedbacks
- will be able to undertake the adequate steps in various reactor operation conditions
- will be able to sketch and implement an accident scenario for a Boiling Water Reactor
- will be able to demonstrate how reactor simulators can be used in training and safety culture developmet.

Course contents

Basics of reactor kinetics and reactor dynamics.

Reactor Transients.

Main feedback mechanism in Boiling Water Reactors.

Reactor operator's routine.

Running reactor simulator for different routine and accidental conditions.

Developing and implementation of different scenarious for normal and abnormal reactor operation.

Course literature

Lecture handouts.

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.

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

Written examination, 3 cr.

Computer-based reactor simulator.

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.