



SH2604 Fjärde generationens reaktorer 6,0 hp

Generation IV Reactors

Fastställande

Kursplan för SH2604 gäller från och med HTo8

Betygsskala

P, F

Utbildningsnivå

Avancerad nivå

Huvudområden

Särskild behörighet

Recommended prerequisites: Course in reactor physics (e.g. SH2600) or equivalent knowledge.

Undervisningsspråk

Undervisningsspråk anges i kurstillfällesinformationen i kurs- och programkatalogen.

Lärandemål

The production of commercial nuclear power today is dependent on the availability of U-235, the only fissile nuclide naturally present on earth. Once the easily accessible resources of U-235 become exhausted, a transition to reactors capable of breeding their own fissile fuel from U-238 may become economically feasible. Breeder reactors of "Generation IV"-design, would besides plutonium, also recycle minor actinides, in order to reduce the long-term radio-toxic inventory sent to geological repositories. Another Generation IV-objective is the operation at high temperature, leading to better conversion efficiency, thus compensating for the higher maintenance and fuel costs of these systems. After this course, you will be able to make design choices that makes Generation IV reactors sustainable, safe and reasonably economical. This objective is achieved if you show that you are able to * calculate and analyse reactor safety parameters in fast neutron reactors.* assess breeding performance for potential fuels and coolants* select structural materials that permit high burnup in fast neutron spectra An intrinsic objective of the course is to achieve skills necessary for working as a scientist or engineer. The main assignment is therefore formulated as a project/research task, which will be presented in the form of a conference paper.

The objective is accomplished if you show that you are able to

- identify missing pieces of information necessary to complete the research task and independently find this information from external sources.
- assess and use contents of references,
- communicate with your colleagues and your teacher about progress and problems arising during research,
- orally as well as in writing present the outcome of your results in a scientific and pedagogic manner.

Passing the course typically means that you have attended 20 hours of meetings, and performed 140 hours of work in your office. Most effort is thus to be done out of class.

Kursinnehåll

1. Physics of breeding
2. Safety parameters in fast neutron systems
3. Liquid metal and gas coolants
4. Fuels for fast reactors
5. Radiation damage in fast neutron spectra
6. Core design

Kurslitteratur

* Waltar and Reynolds, Fast Breeder Reactors, Pergamon Press, 1981.

* Computer code manuals

* Collection of scientific articles

Examination

- PRO2 - Säkerhetsparametrar i snabbreaktorer, 1,0 hp, betygsskala: P, F
- PRO1 - Tvärsnitt i snabba neutronspektra, 1,0 hp, betygsskala: P, F
- PRO4 - Författande av konferensrapport, 2,0 hp, betygsskala: P, F
- TEN1 - Intervju om konferensrapport, 1,0 hp, betygsskala: P, F
- PRO3 - Kylmedel-, kapsling- och bränsletemperaturer, 1,0 hp, betygsskala: P, F

Examinator beslutar, baserat på rekommendation från KTH:s handläggare av stöd till studenter med funktionsnedsättning, om eventuell anpassad examination för studenter med dokumenterad, varaktig funktionsnedsättning.

Examinator får medge annan examinationsform vid omexamination av enstaka studenter.

När kurs inte längre ges har student möjlighet att examineras under ytterligare två läsår.

Betygsskalan är godkänd/icke godkänd, emedan examinationsformen består av inlämningssuppgifter i form av mindre projektarbeten, som redovisas skriftligt (i grupp) och muntligt (grupp samt individuellt).

Övriga krav för slutbetyg

To pass the course you should actively participate in all course meetings. In-between lecture meetings, the result of home assignments will be presented and discussed at special course meetings. If you cannot attend a meeting, report this in advance, and you will be given an extra written assignment to replace the meeting you missed.

1. Calculation of cross sections for different coolants.
2. Calculation of neutronic safety parameters.
3. Calculation of coolant, clad and fuel temperatures.

You are further required to have participated in writing and presenting a conference report with the title "Performance and safety of a Generation IV reactor with coolant A and fuel B". The research for the report will be done in groups. The paper is to be presented orally at one of the course meetings. The final examination constitutes of an individual discussion with the teacher about the contents of the paper, lasting 30-60 minutes.

Etiskt förhållningssätt

- Vid grupparbete har alla i gruppen ansvar för gruppens arbete.
- Vid examination ska varje student ärligt redovisa hjälp som erhållits och källor som använts.
- Vid muntlig examination ska varje student kunna redogöra för hela uppgiften och hela lösningen.