

Applied Nuclear, Neutron and Reactor Physics

FKFN25 / FYST18
2018

www.nuclear.lu.se/utbildning/valfria_kurser/tillaempad-kaern-neutron-och-reaktorfysik/

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Program

- General presentation
- Settle groups and schedules for tutorials and lectures.

Main components

- **Theory** covered as Projects, Tutorials and/ or lectures
- **Laboration** (graded)
- **Essay project in four steps** (graded):
 - a) Introduction on library resources/ LUB support/
 - b) Writing followed by a Short oral presentation.
 - c) Preliminary version of essay reviewed by fellow students
 - d) Revised version of essay handed in.

Theory about

- Neutron Detector Instrumentation
- Neutron Physics with ESS relevance
- Nuclear Reactors

Reactor physics

- Introduction to Nuclear Engineering, Lamarsh/
Baratta, 2001
ISBN: 0201824981,
e.g. at <http://www.amazon.com>
- Tutorials: Neutron interactions, cross-sections,
fission
Nuclear fuels, handling and waste, reactor
components, power reactors, breeders

Neutron Physics with ESS relevance

- Spallation
- Moderation
- Scattering
- Pulsed beams ..

Tutorials – Group discussion

- Students and teacher well prepared.
- One/two students have prepared a summary (power-point or similar) and leads the discussion.
- Other students have prepared at least two questions in advance and e-mailed them to the responsible teacher not later than at 24:00 the day before.
- Each tutorial takes about 1.5 hour and has a group size of approximately 4-6 students.

Laboratory exercises:

- **Fast neutron** detection (state of the art equipment for research/teaching)

Topics for the paper, examples

- Helium-3 crisis
- Imaging with neutrons – an overview
- Production of enriched uranium
- Recycling and reprocessing of nuclear waste
- Transmutation of nuclear waste
- Modern light-water reactors (e.g. the new Finnish)
- The future of Thorium reactors
- Fast Breeder reactors
- Generation IV reactors (e.g. ASTRID the French sodium cooled reactor, the KTH lead-cooled reactor, now in Canada)
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Reviewing process and Academic Conduct

- Each paper is reviewed by two students and commented. In addition, URKUND, that is a web-based facility to counteract plagiarism will be used. Please visit the homepages
<http://www.lub.lu.se/laeranderesurser/akademisk-hederlighet> (about Academic Conduct)
and
http://www.urkund.com/int/en/om_URKUND.asp
- Reviews are returned to the author for possible changes
- Final version is handed in and graded. In addition, each paper should be orally presented (20 min + discussion).

Today and This week

- Schedule for Reactor Physics tutorials and a Introductory lecture
- Decide topic for scientific paper.
- Introduction/exercise to library resources for literature search and citation principles, given by Annika Nilsson, Lund university library. - Bring laptop!

FKFN25/FYST18		Schedule and plan Applied neutron, ion beam and reactor physics 2018				(version	15-Jan)
LTH	Calender	Neutron detectors 1p	Reactor Physics 3p	Neutron physics for ESS 1p	Project (paper) 1.5p	Lab 1p	
		Francesco	Jan	Hanno	Francesco/Annika	Hanno/Emil	
v1	15-jan 16-jan 18-jan		Intro Reactor at 11:15 B113 Chap 4a B113 10:15				
v2	22-jan 23-jan 25-jan	Intro detect. 11:15 B113	Ch 4b B113 13:15 Ch 5 B113 10:15		Intr. LUB resources 10:15, B113 Title decided!		
v3	29-jan 02-feb	Oral Pres. 10:00 B113		Intro, 13:15 B113	Writing ...		
v4	05-feb 09-feb	Written report	Ch 6a? B113 13:15	Tutorial, 10:15 B113			
v5	12-feb		Ch 6b+7a?				
v6	19-feb 22-feb		Ch 7b?			Lab Fast neutrons	
v7	26-feb				Oral presentation, Draft version for review		
v8	05-mar						
	Exam week				Final version.		