LUNDS UNIVERSITET
Lunds Tekniska Högskola

Course syllabus

Produktion av fotoner och neutroner för vetenskap
Photon and Neutron Production for Science

EXTF90, 7,5 credits, G2 (First Cycle)

Valid for: 2023/24
Faculty: Faculty of Engineering, LTH
Decided by: PLED N
Date of Decision: 2023-04-17

General Information

Main field: Nanoscience.
Elective for: BME4-bf, F4, F4-axn, MNAV2, N4
Language of instruction: The course will be given in English

Aim

The aim of the course is to give a general overview of the production in accelerators and reactors of neutrons and photons for science. The course aims at providing a solid base for future studies towards the construction of and science at the large facilities such as MAX IV and ESS.

Learning outcomes

Knowledge and understanding
For a passing grade the student must

- be able to describe and explain different accelerator types and their way of operation
- be able to describe how photons and neutrons are produced with accelerators and further led to the experiments
- know and be able to describe other photon and neutron sources and related (nuclear) reactions.
- be able to discuss the use of photons and neutrons within research, medicine and industry through examples.

Contents

The course gives an overview of how photons and neutrons are produced for scientific use.

The course begins with going through different accelerators (linear accelerators and synchrotrons, linear proton acceleration). Different components of the accelerators are introduced and the general theory about how different components, e.g., magnets are used in the accelerators. Basic electron beam dynamics is presented. Machines for producing synchrotron light (synchrotrons) and neutrons (Spallation sources) are described in more detail.

An overview to conventional light sources and reactor based neutron sources is also given. A special focus is then set to beamlines (for photons) and neutron guides (for neutrons), their way for operation and structure. Different components of typical beamlines and neutron guides are introduced together with underlying theory of optics which is the foundation of designing and optimizing them.

Finally, current research methods based on synchrotron radiation and neutrons are presented together with their applications in natural sciences, medicine and technology.

Examination details

Grading scale: UV - (U,G,VG) - (Fail, Pass, Pass with Distinction)
Assessment: Written examination, written report, oral presentation and hand-in exercises. The final grade for the course is determined by the aggregated results of the different parts of the examination.

The examiner, in consultation with Disability Support Services, may deviate from the regular form of examination in order to provide a permanently disabled student with a form of examination equivalent to that of a student without a disability.

Admission

Assumed prior knowledge: Basic courses i mathematics and physics.
The number of participants is limited to: 20
Selection: Completed university credits within the program. Priority is given to students enrolled on programmes that include the course in their curriculum.

Reading list

- Literature is compiled and produced by the course coordinators.

Contact and other information

Course coordinator: Francesca Curbis, francesca.curbis@maxiv.lu.se
Course homepage: http://www.fysik.lu.se/utbildning/naturvetenskap/kurser/grundnivaa/
Further information: The course is given by the Faculty of Science and does not follow the study period structure.