Faculty of Science

MAXM16, Experimental Methods and Instrumentation for Synchrotron Radiation Research, 7.5 credits

Experimentella metoder och instrumentering för synkrotronljusforskning, 7,5 högskolepoäng

Second Cycle / Avancerad nivå

Details of approval

The syllabus was approved by Study programmes board, Faculty of Science on 2008-11-14 and was last revised on 2008-11-14. The revised syllabus applies from 2008-11-14, autumn semester 2008.

General Information

The course belongs to the main fields of synchrotron radiation based science and physics at the Faculty of Science. It is included in the Master of Science programme in Synchrotron Radiation Based Science at the faculty. The course is a compulsory second cycle component of a Master of Science degree in Synchrotron Radiation Based Science. It is also offered as a freestanding course.

Language of instruction: English

Main field of studies	*Depth of study relative to the degree requirements*
Synchotron Radiation Based Science	A1F, Second cycle, has second-cycle course/s as entry requirements

Learning outcomes

On completion of the course, the students shall have acquired the following knowledge and skills:

Knowledge:

- specialised knowledge of the properties of the synchrotron radiation source (bending magnet, undulator, wiggler).
- optical components (focusing, imaging, diffracting) for photon energy ranges from infrared to hard x-rays.
- construction of a beamline for spectroscopy, structure determination, imaging, microscopy, tomography etc.

- experimental techniques and methods of spectroscopy, structure determination, imaging, microscopy, tomography etc.

Skills:

- ability to perform a simulation and thereby opimising parameters for undulators and wigglers based on a requirement specification for the photon energy range, photon flux, polarisation, etc., as well as the performance (electron energy, emittance, beam size, etc.) of the storage ring
- ability to perform a simulation and thereby optimising parameters for optical components (including reflective, refractive and diffractive) in order to optimise the performance with regard to the photon energy range, photon flux, energy resolution, polarisation, focusing etc.
- for a given research issue, ability to identify the synchrotron radiation-based and/or free-electron laser-based method/s that may be applicable to the solution of the problem
- ability to cooperate with beamline operators and technicians at a synchrotron radiation laboratory
- communicate basic synchrotron radiation results to the public and to colleagues
- assess the plausibility and significance of reported results

Course content

The course is not divided into different components. It comprises 7.5 credits and includes:

- a presentation of the properties of synchrotron radiation from bending magnets, insertion devices, and how they are linked to the parameters of the storage ring and the insertion device.
- a presentation of the optical components which can be used for focusing, monochromatisation and polarisation of synchrotron radiation.
- a presentation of experimental methods based on synchrotron radiation.
- a presentation of properties and experimental methods for free electron lasers.

Course design

The teaching consists of lectures, laboratory experiments and demonstrations at MAX Laboratory, seminars and group exercises. Participation in group exercises, demonstrations, lab experiments and associated teaching is compulsory.

Assessment

The assessment is based on written assignments.

Students who fail an assessment will be offered another opportunity for assessment soon thereafter.

Subcourses that are part of this course can be found in an appendix at the end of this document.

Grades

Marking scale: Fail, Pass, Pass with distinction.
For a grade of Pass on the whole course, the student must have passed the lab reports and written assignments, and participated actively in all compulsory components.

The final grade is determined by an aggregate of the results on all assessed components

Students who wish to supplement their regular grade with ECTS grades must submit a request to the course director no later than one week after the start of the course.

Entry requirements

To be admitted to the course, students must meet the general entry requirements for admission to Swedish higher education, and have 90 credits in science, including the courses MAXM06 Introduction to Synchrotron Radiation Based Science, 7.5 credits, and MAXM07 Introduction to Accelerators and Free Electron Lasers, 7.5 credits.

Further information

The course may not be included in a degree together with MAXM11 Experimental Methods and Instrumentation for Synchrotron Radiation Research, 10 credits.

Subcourses in MAXM16, Experimental Methods and Instrumentation for Synchrotron Radiation Research

Applies from H09

0801 Experimental Methods and Instrumentation for Synchrotron R., 7,5 hp
Grading scale: Fail, Pass, Pass with distinction