



**LUNDS UNIVERSITET**  
Lunds Tekniska Högskola

*Course syllabus*

# **Experimentella metoder och instrumentering för synkrotronljusforskning**

## **Experimental Methods and Instrumentation for Synchrotron Radiation Research**

**EXTN90, 7,5 credits, A (Second 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:** F4, F4-axn, MNAV2, N4

**Language of instruction:** The course will be given in English

### **Aim**

The aim of the course is to go deeper into the synchrotron light sources, beamlines and experimental methods. This includes also calculating and modeling the properties of synchrotron light sources and beamlines.

### **Learning outcomes**

*Knowledge and understanding*

For a passing grade the student must

have knowledge about

- properties of synchrotron radiation sources (bending magnets, undulators, wigglers).
- optical components (focusing, imaging and diffractive) for photons in the energy range from infrared to hard X-rays.
- design of beamlines for spectroscopy, structural determination, imaging, microscopy and tomography.
- experimental techniques and methods for spectroscopy, structural determination, imaging, microscopy and tomography.

### *Competences and skills*

For a passing grade the student must

be able to

- perform computer simulations to optimize design parameters for insertion devices given requirements on photon energy range, photon flux and polarization as well as given properties of the storage ring (electron energy, emittance and beam size).
- perform computer simulations to optimize design parameters for optical components (reflective, refractive and diffractive) in order to optimize their performance in terms of photon energy range, photon flux, energy resolution, polarization and focusing properties.
- identify appropriate synchrotron and/or free electron laser based methods suitable for solving a specific scientific problem.
- communicate with beamline specialists and technicians at a synchrotron radiation laboratory.

### *Judgement and approach*

For a passing grade the student must

- present basic results from synchrotron radiation experiments to the public and to colleagues.
- judge the plausibility and significance of reported results

## **Contents**

- Properties of synchrotron radiation from bending magnets and insertion devices and how these properties are coupled to the parameters of the storage ring and the bending magnet/insertion device.
- Optical components used for focusing, monochromatization and polarization of synchrotron radiation.
- Experimental techniques based on synchrotron radiation.

## **Examination details**

**Grading scale:** UV - (U,G,VG) - (Fail, Pass, Pass with Distinction)

**Assessment:** Scientific presentation, passed laboratory exercises and hand-in exercises. Participation in the group and experimental work, study visits, demonstrations and related education and hand-in duties is compulsory. 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:** EXTF90 Photon and Neutron Production for Science.

**The number of participants is limited to:** No

## **Reading list**

- According to a list established by the department and available at least five weeks before

the start of the course, see [www.maxiv.lu.se](http://www.maxiv.lu.se).

## **Contact and other information**

**Course coordinator:** Sverker Werin, [sverker.werin@maxiv.lu.se](mailto:sverker.werin@maxiv.lu.se)

**Course homepage:** <http://www.maxiv.lu.se>

**Further information:** The course is given by the Faculty of Science and does not follow the study period structure.