

# Syllabus

for course at advanced level

**Modern X-ray Science: Theory and Applications**  
**Modern röntgenforskning: teori och tillämpningar**

**7.5 Higher Education  
Credits**  
**7.5 ECTS credits**

<b>Course code:</b>	FK7067
<b>Valid from:</b>	Autumn 2018
<b>Date of approval:</b>	2018-08-20
<b>Department</b>	Department of Physics
<b>Main field:</b>	Physics
<b>Specialisation:</b>	A1N - Second cycle, has only first-cycle course/s as entry requirements

## Decision

This course plan has been established by the Board of Science at Stockholm University on 2018-XX-XX.

## Prerequisites and special admittance requirements

Admission to the course requires knowledge equivalent to passed courses (excluding introductory courses) of 45 credits in mathematics and 60 credits in physics, where the courses Programming, Numerical Methods and Statistics for Physicists, 15 credits (FK4026), Quantum Mechanics, 7.5 credits (FK5020) and Atomic and Molecular Physics, 7.5 credits (FK5023) should be included. Additionally, requires knowledge equivalent to upper secondary school English B/English 6.

## Course structure

Examination code	Name	Higher Education Credits
HELA	Modern X-ray science: Theory and Applications	7.5

## Course content

The scope of this course is to give an overview of the x-ray methods that are used currently worldwide, starting from the fundamental theory behind and building up to modern state-of the art techniques. The lectures will follow the multidisciplinary character of the field by including examples from physics, material science, biology and chemistry. The course content includes:

- x-ray diffraction applications from crystalline and non-crystalline materials,
- small-angle x-ray scattering (SAXS),
- wide-angle x-ray scattering (WAXS),
- x-ray spectroscopy (XAS, XES, EXAFS, ARPES),
- magnetic interactions (XMCD)
- coherent diffraction (Imaging, Holography, XPCS).

## Learning outcomes

It is expected that the student after taking the course will be able to:

- formulate and apply basic knowledge including the theory behind each technique,
- perform model simulations to illustrate the basic principles of the different methods,
- discriminate different experimental scattering and spectroscopic techniques
- get insight into and connect the content of the course to the x-ray science research field.

## Education

Instruction consists of lectures and study visit at research laboratory.

The course will be given in English if requested by any student enrolled.

### **Forms of examination**

a. The course is examined as follows: knowledge assessment takes the form of written and oral project presentations and homework problems.

If the instruction is in English, the examination may also be conducted in English.

b. Grades will be set according to a seven-point scale related to the learning objectives of the course:

A = Excellent

B = Very good

C = Good

D = Satisfactory

E = Adequate

Fx = Fail, some additional work required

F = Fail, much additional work required

c. The grading criteria will be distributed at the beginning of the course.

d. In order to pass the course, a minimum grade of E is required.

e. Students who receive a failing grade on a regular examination are allowed to retake the examination as long as the course is still provided. The number of examination opportunities is not limited. Other mandatory course elements are equated with examinations. A student who has received a passing grade on an examination may not retake the examination to attain a higher grade. A student who has failed the same examination twice is entitled to have another examiner appointed, unless there are special reasons to the contrary. Such requests should be made to the department board.

The course includes at least two examination opportunities per year when the course is given. At least one examination opportunity will be offered during a year when the course is not given.

f. Students awarded the grade Fx are given the opportunity to improve their grade to E. The examiner decides the supplementary assignments to be performed and the pass mark criteria. The supplementary assignments will take place before the next examination session.

### **Interim**

Students may request that the examination be conducted in accordance with this course plan even after it has ceased to be valid. However, this may not take place more than three times over a two year period after course instruction has ended. Requests must be made to the departmental board. The provision also applies in the case of revisions to the course plan (and the revisions of the course literature).

### **Misc**

The course can be included as part of the master's programs offered at the Physics department, but is also offered as a separate course or as a PhD course.

### **Required reading**

The course literature is decided by the department board and published on the Department of Physics's website at least two months before the start of the course.