

Syllabus

for course at advanced level

Detector Physics
Detektorfysik

**7.5 Higher Education
Credits**
7.5 ECTS credits

Course code:	FK7056
Valid from:	Autumn 2019
Date of approval:	2017-08-18
Changed:	2017-08-18
Department	Department of Physics
Main field:	Physics
Specialisation:	A1N - Second cycle, has only first-cycle course/s as entry requirements

Decision

This syllabus was established by the Board of the Faculty of Science at Stockholm University on 2017-08-18. A technical revision was made on 2019-04-30.

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 Experimental Physics, 7.5 credits (FK5021), Quantum Mechanics, 7.5 credits (FK5020) and Atomic and Molecular Physics, 7.5 credits (FK5023) or Quantum Phenomenology and Radiation Physics, 7.5 credits (FK5015) should be included, or corresponding knowledge acquired from other courses. Additionally, requires knowledge equivalent to upper secondary school English B/English 6.

Course structure

Examination code	Name	Higher Education Credits
HELA	Detector Physics	7.5

Course content

All physical measurements require a detector and all experimental physicists need a working knowledge of detector physics. The course will give an introduction to radiation and particle detectors and their use in Experimental Physics and in different application areas.

The course covers basic physical processes for the detection of radiation and particles, photo-electric effect, Compton scattering, pair production, excitation, ionization, bremsstrahlung, Cherenkov radiation, nuclear reactions and secondary emission.

The principle and characteristics of the following detector types:

- charged particle detectors
- charge-coupled devices (CCD)
- light sensors
- gas detectors
- scintillation detectors
- semiconductor detectors
- bolometric detectors.
- Detection systems in molecular, atomic, nuclear and particle physics, quantum optics as well as in medicine, accelerator physics and other fields. Signal processing, measurement methodology and performance metrics.

Practical exercises provide familiarity with in-depth knowledge of different types of detectors.

Learning outcomes

Upon completion of the course, students are expected to be able to:

- describe the fundamental physical processes for the detection of radiation and particles.
- describe the principles and characteristics of different types of detectors.
- assess the applicability of different types of detectors and detector systems.
- carry out, evaluate and report on measurements with different types of detectors.

Education

Instruction consists of lectures, group work, exercises and laboratory work.

Participation in laboratory work and group education is compulsory. If special circumstances exist, the examiner may, after consultation with the relevant teacher, allow the student exemption from the obligation to participate in certain compulsory education.

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

Forms of examination

a. The course is assessed as follows: knowledge takes place through written and oral exams and laboratory reports. If the instruction is in English this may also apply to the examinations.

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, students must receive a minimum grade E, take part in all compulsory instruction and pass the labs.

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).

Limitations

The course may not be included in examinations in combination with courses Detector Physics, 7.5 credits (FK7043) or Radiation Detectors and Measuring Methods (FK4016) or equivalent courses.

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.

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.