

# Syllabus

for course at advanced level

**Condensed Matter Physics**

**Kondenserade materiens fysik**

**7.5 Higher Education**

**Credits**

**7.5 ECTS credits**

<b>Course code:</b>	FK7060
<b>Valid from:</b>	Autumn 2017
<b>Date of approval:</b>	2017-01-16
<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 2017-01-16.

## 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 Quantum Mechanics, 7.5 credits (FK5020), Atomic and Molecular Physics, 7.5 credits (FK5023) and Statistical Mechanics and Condensed Matter, 7.5 credits, (FK5025) should be included. Additionally, admission to the course requires knowledge equivalent to upper secondary school English B/English 6.

## Course structure

Examination code	Name	Higher Education Credits
TEOR	Theory	5.5
EXPT	Experiment	2

## Course content

a. The course covers basic concepts of condensed matter physics such as crystal structures, Drude model and Sommerfeld theory, phonons, Bloch's theorem, reciprocal space, tight binding model, the nearly free electron model, energy bands and quasi-particles, semiconductors, and magnetism. An overview is given of the variety of physical properties that different materials exhibit, including optical, thermal, electrical, and magnetic effects. Experimental techniques for fundamental studies of materials are introduced.

b. The course consists of the following course units:

TEOR, Teori (Theory) 5.5 credits

EXPT, Experiment (Experiment) 2 credits

## Learning outcomes

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

TEOR, Teori (Theory) 5.5 credits

- Explain and describe basic physical descriptions of material properties
- Describe the optical, thermal, electrical, and magnetic properties of different materials and relate these to their electronic and crystal structures
- Identify relevant physical models and use and apply their mathematical description

EXPT, Experiment (Experiment) 2 credits

- Explain, analyze and discuss experimental methods and interpret the corresponding measurement results in condensed matter physics

### **Education**

Instruction consists of lectures and laboratory work.

Participation in laboratory work and any associated integrated instruction is compulsory. In the event of special circumstances, the examiner may, after consultation with the teacher concerned, grant a student exemption from the obligation to participate in certain compulsory instruction.

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 TEOR, Teori (Theory) hand-in exercises and written exam. EXPT, Experiment (Experiment) written report and oral presentation. If the instruction is in English, the examination may also be conducted in English.

b. For each unit of the course, 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

The final grade on the course is determined by weighting the grades from all course units, where each grade is weighted in relation to the scope of the course unit.

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 for each unit of the course TEOR Theory and EXPT Experiment.

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 Condensed Matter Physics I (FK3004) or Condensed Matter Physics I (FK7042) or equivalent.

### **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.