

# Syllabus

for course at advanced level

**Physical Measuring Techniques**  
**Fysikalisk mätteknik**

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

<b>Course code:</b>	FK7063
<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 Experimental Physics, 7.5 credits (FK5021), Programming, Numerical Methods and Statistics for Physicists, 7.5 credits (FK4026) 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
EXPT	Experiment	2.5
BEGR	Concepts	5

## Course content

a. The course deals with problems and questions in connection with physical measurements. Initially the measurement process is discussed from knowledge theoretical and statistical perspective. Transform methods are used to analyze dynamical processes. The Fourier transform is used to discuss system properties, the Laplace transform to describe control systems and stability and the Z-transform to describe digital signal processing. Image processing parallels are discussed using the 2 dimensional Fourier transform. The course deal with different issues like: signals, noise, data acquisition, data reduction, triggering, control systems, pulse electronics, transmission lines, grounding, sensors, transducers, measuring modules, measuring systems and software for measurement control.

b. The course consists of the following course units:

KONC, Konzept (Concepts) 5 credits  
EXPT, Experiment (Experiment) 2.5 credits

## Learning outcomes

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

- KONC, Konzept (Concepts) 5 credits
- describe the process of measuring from an epistemological and statistical perspective
- describe the role of control systems in the measuring process

- describe how signals and noise are effected in different modules, connections and detectors  
EXPT, Experiment (Experiment) 2.5 credits
- handle signals and noises using experiments and explain the procedure
- perform measurements where signals are analyzed with Fourier transformation and filters
- use control system and explain how it works

### **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 KONC, Koncept (Concept) written exam EXPT, Experiment (Experiment) written report. 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

The course unit KONC will be graded according to the seven-point scale, and the course unit EXPT will be graded according to a two-point scale: Pass (G) or Fail (U).

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

d. In order to pass the course, students must receive a passing grade on all course units KONC Concept 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 course Physical Measuring Techniques, 7.5 credits (FK8010) 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.