EK1190 Measurement Technology 7.5 credits

Mätteknik

This is a translation of the Swedish, legally binding, course syllabus.

If the course is discontinued, students may request to be examined during the following two academic years

Establishment

Course syllabus for EK1190 valid from Autumn 2009

Grading scale

A, B, C, D, E, FX, F

Education cycle

First cycle

Main field of study

Electrical Engineering,Technology

Specific prerequisites

Language of instruction

The language of instruction is specified in the course offering information in the course catalogue.

Intended learning outcomes

After the course, the student should be able to

- describe the basics of electrical safety: hazards and safety measures,
- describe the basic concepts of measurement technology and metrology, especially how measurement units are defined and how tractability is achieved,
- describe how electrical nose and disturbances are generated, propagated into the circuits, how this can be modelled and how the effects can be minimized,
- use oscilloscopes and multimeters to measure voltage, current and resistance both in the static and time-varying case,
- describe how several different types of AD-converters work and how this influences their performance
- draw a block diagram for a multimeter and describe how it handles other quantities than DC voltage and how this influences the performance,
- draw a block diagram for the oscilloscope and describe the effects of bandwidth, sampling frequency, input impedance and uncertainty in the instrument,
- use resistive sensors for measurement of temperature and strain,
- describe the basics of modern sensor technology and how sensors based on piezoelectricity, capacitance and inductance are used,
- describe the most basic strategies for computerized measurement systems, like AD-cards and different bus systems,
- describe the basic principles for spectrum analyzers and how the features of the analyzed signal show up in the time domain results ad the frequency desman results,
- be able to compute the standard uncertainty and confidence interval for a combined quantity based on uncertainty information of different kinds for the quantities that contribute to the combined quantity
- apply the above knowledge and abilities in problem solving and practical measurements

Course contents

- Electrical safety issues.
- Basic concepts of measurements: units and standards, traceability, uncertainty calculations, documentation.
- Measurement of static electrical quantities: introduction to digitalisation, the multimeter.
- Measurement of time-varying quantities: sampling, the oscilloscope.
- Electromagnetic compatibility (EMC).
- Measurement of time-varying quantities: sampling, aliasing, spectrum analysis.
- The computer in the measurement system: hardware configurations, software, virtual instruments.
- Sensors: physical principles, common types, fabrication technologies, applications.

Disposition

Lectures 22 h

Lessons 12 h

Lab work 5 x 4 h = 20 h

Course literature

Literature and laboratory notes sold by the department as well as web pages.

Examination

- LAB1 - Laboratory Work, 2.0 credits, grading scale: P, F
- LAB2 - Laboratory Work, 3.0 credits, grading scale: P, F
- TEN1 - Examination, 2.5 credits, grading scale: A, B, C, D, E, FX, F

Based on recommendation from KTH's coordinator for disabilities, the examiner will decide how to adapt an examination for students with documented disability.

The examiner may apply another examination format when re-examining individual students.

Laboratory assignments.
Several smaller tests during both parts.
The theoretical teaching in each subsection will be concluded with a web-based test or a short written test. The conclusions within the exam is strongly related to the labs.

Other requirements for final grade

Lab course 1: 2 labs including webbased tests, P/F, 2 ECTS credits.

Lab course 2: 3 labs including webbased tests, P/F, 3 ECTS credits.

Written exam, A, B, C, D, E, Fx, F, 2.5 ECTS credits.

Ethical approach

- All members of a group are responsible for the group's work.
- In any assessment, every student shall honestly disclose any help received and sources used.
- In an oral assessment, every student shall be able to present and answer questions about the entire assignment and solution.