EK1191 Measurement Technology 6.0 credits

Mätteknik

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

Establishment

On 04/21/2020, the Head of the EECS School has decided to establish this official course syllabus to apply from autumn semester 2020, registration number: J-2020-0555.

Grading scale

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

Education cycle

First cycle

Main field of study

Technology

Specific prerequisites

Completed course corresponding to EI1110 Electrical circuit analysis, extended course.

Active participation in a course offering where the final examination is not yet reported in LADOK is considered equivalent to completion of the course. This applies only to students who are first-time registered for the prerequisite course offering or have both that and the applied-for course offering in their individual study plan.

Language of instruction

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

Intended learning outcomes

On completion of the course, the student should be able to:

- describe the basic concepts of measurement technology and metrology, especially how measurement units are defined and how traceability is achieved,
- describe how electrical noise and interference arise, how they, in simple cases, can be modelled and how they can be minimized,
- describe the design of oscilloscopes and multimeters, and understand how their performance influences the measurement result and applicability,
- describe how several types of AD-converters work and how this influences their sensitivity to noise in the input signal,
- use oscilloscopes and multimeters to measure voltage, current and resistance both in the static and time-varying case,
- use resistive sensors for measurement of temperature and strain,
- describe modern sensor technology and how sensors based on piezoelectricity, capacitance and inductance are used,
- describe the most common ways to build a computer-aided measurement systems,
- describe the basic principles of spectrum analyzers and how the features of the analyzed signals in the time domain show up in the frequency domain results,
- be able to compute the standard uncertainty and confidence interval for a combined quantity, following the recommendations of GUM, based on uncertainty information for the different kinds of quantities contributing to the combined quantity,
- document and report experimental results orally and in writing,
- apply the above knowledge and abilities in problem solving and experimental work, both independently and when working in a group.

Course contents

- Basic concepts of measurements: units and standards, traceability, uncertainty calculations, documentation.
- Measurement of static and dynamic electrical quantities: sampling, discretization, aliasing, spectrum analysis. Applications with multimeter and oscilloscopes.
- Electromagnetic Compatibility (EMC).
- The computer in the measurement system: hardware configurations, software, virtual instruments.
- Sensors: physical principles, common types, fabrication technologies, applications.

Examination

- TEN1 - Written Examination, 2.0 credits, grading scale: A, B, C, D, E, FX, F
- LAB4 - Lab, 1.0 credits, grading scale: P, F
- LAB3 - Lab, 1.0 credits, grading scale: P, F
- LAB2 - Lab, 1.0 credits, grading scale: P, F
- LAB1 - Lab, 1.0 credits, grading scale: P, 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.

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

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.