

SYLLABUS

Measurement and Instrumentation 7.5 credits E0004E

Mätteknik

Course syllabus admitted: Spring 2025 Sp 3 - Present

**DECISION DATE
2024-02-15**

Measurement and Instrumentation 7.5 credits E0004E

Mätteknik

First cycle, E0004E

Education level	Grade scale	Subject	Subject group (SCB)
First cycle	G U 3 4 5	Elektroteknik	Electrical Engineering

Main field of study

Computer Science and Engineering

Entry requirements

In order to meet the general entry requirements for first cycle studies you must have successfully completed upper secondary education and documented skills in English language and knowledge in:

- Mathematical analysis on basic level, linear algebra, differential equations and transforms and calculus (M0050M Basic Mathematics and Derivatives, M0051M Integrals, Vectors and Matrices, M0052M Differential Equations and Transform Theory).
- Introductory electrical engineering; Kirchoffs laws, passive components such as resistors, capacitors and inductors, ideal operation amplifiers, transformers, electric machines, etc (E0013E Fundamentals of Electrical Engineering or E0003E Circuit Theory).
- The student is expected to know how to write simple functions in MATLAB for data analysis and data presentation. Knowledge in English, equivalent to English 6.

Selection

The selection is based on 1-165 credits.

Course Aim

The aim of the course is to give the student knowledge of how to choose and design a measurement system for a given application, based on different measurement principles, modeling, simulation and error analysis.

After completing the course, the student should

- be able to use a Spice based simulation program for analysis and design of electrical measurement systems,
- be able to analyze and perform calculations for the design of both static and dynamic measurement systems
- be able to analyze and manage disturbances and sources of error in a measurement system conduct error and uncertainty analyses
- show laboratory skills by building and using electrical measurement systems consisting of electrical sensors and components as well as data collection equipment
- be able to use both Matlab and LabView for digital data collection, signal processing, calculations and presentation

Contents

• General measurement system principles • Static and dynamic characteristics of measurement systems. • Disturbances in measurement systems and protections against these. • Error and uncertainty analysis • Digital data acquisition using the industry standard LABVIEW. • Electrical modeling and simulations using the industry standard PSpice. • Data analysis and signal processing using MATLAB.

Realization

Each course occasion's language and form is stated and appear on the course page on Luleå University of Technology's website.

• A series of lectures where the core of the course is presented. Examples of typical situations that the students will come across are given. Important to note here that the the examples themselves are not essential but the solving approach they exemplify. The students will then practice their skills on similar problems in homework assignments and laboratory work. • Mandatory lab work includes theoretical homework problems to design the necessary measurement system. During the lab work, the student builds and evaluates the measurement systems. The results must then be interpreted and reported. Special attention is given to the skill of critically analyzing and discussing their own results and possible deviations from theoretical results.

Examination

If there is a decision on special educational support, in accordance with the Guideline Student's rights and obligations at Luleå University of Technology, an adapted or alternative form of examination can be provided.

A summative assessment is done through completed laboratory sessions with written reports and a voluntary written exam. The laboratory sessions are mandatory and are graded Fail (U) Pass (G). A pass on the complete set of lab assignments renders a grade 3 on the course. A voluntary written exam is available at the end of the course and is graded U 3 4 5. If a higher grade than 3 is obtained on the written exam, then the course grade will be raised to that grade.

Unauthorized aids during exams and assessments

If a student, by using unauthorized aids, tries to mislead during an exam or when a study performance is to be assessed, disciplinary measures may be taken. The term "unauthorized aids" refers to aids that the teacher has not previously specified as permissible aids and that may assist in solving the examination task. This means that all aids not specified as permissible are prohibited. The Swedish version has interpretative precedence in the event of a conflict.

Overlap

The course E0004E is equal to SME101

Course offered by

Department of Computer Science, Electrical and Space Engineering

Modules

Code	Description	Grade scale	Cr	Status	From period	Title
0005	Laboratory work	U G#	7.5	Mandatory	S22	
0006	Written exam	G U 3 4 5		Selectable	S22	

Study guidance

Study guidance for the course is to be found in our learning platform Canvas before the course starts. Students applying for single subject courses get more information in the Welcome letter. You will find the learning platform via My LTU.

Last revised

by Robert Brännström 2024-02-15

Syllabus established

by the Department of Computer Science and Electrical Engineering 2007-02-28