

# Measurement Technology

Programme course

4 credits

Mätteknik

TFMT13

Valid from: 2017 Spring semester

**Determined by**

Board of Studies for Computer Science and  
Media Technology

**Date determined**

2017-01-25

## Main field of study

Computer Science and Engineering, Electrical Engineering

## Course level

First cycle

## Advancement level

G1X

## Course offered for

- Computer Science and Engineering, M Sc in Engineering
- Computer Engineering, B Sc in Engineering

## Entry requirements

Note: Admission requirements for non-programme students usually also include admission requirements for the programme and threshold requirements for progression within the programme, or corresponding.

## Prerequisites

Be able to explain and solve problems in simple current circuits, with series and parallel connections by use of the jw-method together with Ohm's and Kirchhoff's laws, that is, basic knowledge of electronics. Be able to exemplify and decide simple functional relationships, that is, the basic knowledges in calculus in one variable.

## Intended learning outcomes

After the course the student should be able to:

- Describe principles and solve problems in connection with measurements of voltage, current, and impedance in basic circuits for data acquisition.
- Explain principles of pulse propagation, reflection and transmission on cables, with character of transmission lines, at different source resistance and loads.
- Explain the origins and reduction of electrical disturbances.

- Describe the function of data acquisition cards and describe how computers can be used to control measurements with external instruments in a LabView environment.
- Give examples on and solve problems in connection with temperature transducers and transmitters.

## Course content

Measurement of current, voltage, and impedance using multimeters and oscilloscopes. The effect of the measuring circuit at different impedance and instrument loadings. Digital oscilloscopes with applications on measurement of pulses and pulse reflections on transmission lines with different types of matchings. Frequency analysis. Measurement and calibration of temperature transducers. Coupling, trim, and measuring of a typical measurement chain, containing: transducer, transmitter, optical fiber, and data acquisition card, is performed. A data acquisition card for computer-based measurement of signals from light and temperature transducers is constructed and tested. The card, consisting of MUX (multiplexer), SOH (sample and hold circuit), and ADC (analog/digital converter), is measured and tested step by step during the construction. Finally, the card is connected to a computer and a simple program is written, which acquires data from two transducers. Measurement of temperature with an IC-circuit for control of the temperature in a box. The measurement noise is reduced by a mean value process. The measurements is performed in a LabView environment. Electrical disturbances; the origin of and reducing of capacitive (electric field) and inductively coupled disturbances. Measurements and control of external measurement equipment through the computer (SCPI, USB, GPIB).

## Teaching and working methods

The course consists of lectures and laboratory experiments in measurement and transducer techniques.

## Examination

LAB1	Laboratory work	U, G	3 credits
UPG2	Home examination	U, 3, 4, 5	1 credits

## Grades

Four-grade scale, LiU, U, 3, 4, 5

## Department

Institutionen för fysik, kemi och biologi

## Director of Studies or equivalent

Magnus Boman

## Examiner

Per Sandström

## Course website and other links

## Education components

Preliminary scheduled hours: 38 h

Recommended self-study hours: 69 h

## Course literature

### **Additional literature**

### **Compendiums**

# Common rules

Regulations (apply to LiU in its entirety)

The university is a government agency whose operations are regulated by legislation and ordinances, which include the Higher Education Act and the Higher Education Ordinance. In addition to legislation and ordinances, operations are subject to several policy documents. The Linköping University rule book collects currently valid decisions of a regulatory nature taken by the university board, the vice-chancellor and faculty/department boards.

LiU's rule book for education at first-cycle and second-cycle levels is available at [http://styrdokument.liu.se/Regelsamling/Innehall/Utbildning\\_pa\\_grund-\\_och\\_avancerad\\_niva](http://styrdokument.liu.se/Regelsamling/Innehall/Utbildning_pa_grund-_och_avancerad_niva).