MG2110 Advanced Metrology 9.0 credits

Avancerad mätteknik

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

Establishment

Course syllabus for MG2110 valid from Autumn 2015

Grading scale

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

Education cycle

Second cycle

Main field of study

Mechanical Engineering

Specific prerequisites

Minimum of 45 cr of second cycle courses completed

and

MG1001, MG1006, MG1026 or MG2104,

or the equivalent

Language of instruction

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

Intended learning outcomes

After passing the course, the student will be able to:

- have a good understanding of the role of measurement in the production chain, as regards computer aided integration and quality control as well as the restrictions and demands given by different manufacturing techniques.
- understand the meaning of the three main purposes of measurement, i.e. to control the production process, the product function and the product design, and how to select appropriate measurement quantities and tools for these purposes.
- have knowledge about different measurement methods and instruments, both traditional and modern that are used in the industry to measure product dimensions, shape and surface structure.
- have ability to handle and interpret measurement data, to estimate measurement uncertainties and to achieve and present traceable measurement results.
- be able to give examples of current research topics in dimensional metrology

Course contents

The role of measurement in the production chain will be treated from different aspects such as

- measurement planning,
- influences of the manufacturing method used,
- design, tolerances and standards, based on Geometrical Product Specification
- control of the production process, the product function and the product design,
- relation to quality control,
- and computer aided integration of measurement in the production process.

The product properties and how it influences the measurement will be discussed, i.e.

- Geometry and shape: Freeform and simple geometries, coordinate measurement and geometry control
- Surface measurement in relation to required function or appearance
- Metrology for micro-nano features
- Metrology for large scale components

Experience of modern metrology equipment by means of demonstrations and lab exercises in collaboration with instrument deliverers

- Coordinate measurement machine

- Measuring arms
- Laser scanner/tracker
- 3D Digitizer
- Vision system
- Surface profiler
- Atomic force microscope
- Confocal and white light interference microscope
- Inteferferometers

Different measurement tools and methods used in the industry will be introduced, mainly mechanical and optical, ranging from traditional to state-of-the-art, including handling of the instruments in order to avoid measurement errors. Management of measurement data, i.e. how to interpretate and present measurement results using statistical and other methods such as signal and image processing will be treated along with estimation of measurement uncertainties based on traceable calibration procedures. The course will be a mixture of lectures, lab and written exercises.

Examination

- INL1 - Homework Assignments, 6.0 credits, grading scale: A, B, C, D, E, FX, F
- LAB1 - Laboratory Exercises, 3.0 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.