MJ2482 Measurement Techniques in Aeromechanics 6.0 credits

Mätteknik i aeromekanik

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 MJ2482 valid from Autumn 2016

Grading scale

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

Education cycle

Second cycle

Main field of study

Mechanical Engineering

Specific prerequisites

Fluid dynamics, thermodynamics, engineering mathematics, BSc level

Only for TAETM

Language of instruction

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

Intended learning outcomes

The course will give the students a general overview to the unsteady measurement techniques used in the area, and the very latest research status regarding several modern techniques.

After completing the course the student will be able to:

• Develop an experiment plan

• Install and maintain an experimental log-book

• Evaluate the pros and cons of using experimental analogy and similarity studies

• Calculate and evaluate the uncertainties in the experimental results

• Present experimental results with uncertainties

• Conduct risk assessment of experimental work, including the risk, likelihood and consequence

• Know about temperature measurements and select the appropriate equipment

• Know about pressure measurements and select the appropriate equipment

• Know about flow measurements and select the appropriate equipment

• Know about unsteady flow measurements and select the appropriate equipment

• Reduce time-resolved unsteady measurement data to data of interest

The second part of the measurement techniques course focuses on measurements in the field of turbomachinery aeromechanics. In specific, the focus is put on unsteady flow and vibration measurements.

After completing the course the student will be able to:

• Know the basic principles of unsteady pressure measurements and various methods of installation of unsteady pressure transducers

• Perform dynamic calibration of a recessed-mounted unsteady pressure transducer and use this transfer function when post-processing test data

• Perform signal analysis of unsteady test data and produce information of interest (such as aerodynamic damping or forcing data)

• Know the basic principles of vibration measurements

• Perform the signal analysis of vibration test data and build a Campbell diagram

• Know about unsteady flow field measurement techniques such as fast-response probes and unsteady optical techniques

• Know the basics of tip timing measurement technology

Course contents

In numerous engineering research projects, extensive experiments and tests are carried out. Arranging the set-up for any engineering experiment, acquiring results, keeping records, handling results and evaluating uncertainties are all crucial steps for achieving reliable performance. In order for the experimentalist to obtain good quality of any experimental set-up, extensive knowledge on measurement equipment, techniques, instruments and tools is required.

Knowledge of measurement techniques is also relevant for researchers conducting numerical studies, as numerical results most often have to be validated with experimental results.

The first part of the course (semester 1) is aimed at providing systematic knowledge about the abovementioned topics, together with introducing the student to various common and advanced measurement techniques and tools in engineering experiments. The course starts from basics and no previous experience with engineering measurements is required.

The second part of the course is focused in experimental techniques for aeromechanical applications treating the specialised topics related to measurement of unsteady flow and mechanical vibrations.

Course literature

Egen litteratur, urval av vetenskapliga artiklar

Examination

- INL1 - Assignment1, 0.5 credits, grading scale: P, F
- INL2 - Assignment2, 0.5 credits, grading scale: P, F
- LAB1 - Laboratory exercise 1, 0.5 credits, grading scale: P, F
- LAB2 - Laboratory exercise 2, 0.5 credits, grading scale: P, F
- TEN1 - Written exam 1, 2.0 credits, grading scale: A, B, C, D, E, FX, F
- TEN2 - Written exam 2, 2.0 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.

TEN A, 3 ECTS, A-F

TEN B, 3 ECTS, A-F

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.