EK2350 Microsystem Technology 7.5 credits

Mikrosystemteknik

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 EK2350 valid from Spring 2015

Grading scale

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

Education cycle

Second cycle

Main field of study

Electrical Engineering

Specific prerequisites

For single course students: 120 credits and documented proficiency in English B or equivalent

Language of instruction

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

Intended learning outcomes

The overall goal of this course is to introduce engineering students to the world of microengineering, i.e. the world of technical components and systems with feature sizes in the range sub-millimetre down to 100 nm. The area is often also referred to as a “MEMS” – Micro Elcreomechnical Systems. The following aspects will be addressed in particular: basic physical principles used for sensing and actuation in microtechnology, methods for microfabrication, the design and operation of the most commonly used micro-components and systems, and the use of microtechnology in specific application areas.

After following the course, the students will have obtained the following skills in particular:

• With respect to

- the basic physical sensing and actuation principles, including microfluidics,

- silicon microfabrication technology, and

- the most relevant types of optical, resonant, inertial, flow, pressure, radiation and thermal microsensors, as well as microfluidic components and RF and telecom devices,

be able to

1. give an overview of the most commonly used methods and techniques
2. explain how these work and can be implemented
3. compare their advantages and drawbacks
4. use their knowledge to make a structured and educated approach to engineering challenges involving microsystem technology.

• With respect to the specific application fields of medical, automotive, biotechnical, optical and telecommunication systems

be able to

5. explain the potential of microsystem technology in terms of size, cost and/or performance.

In addition, the students will gain deeper insight by performing practical work in a clean-room environment and by making a performance evaluation of a microsystem.

Course contents

A seminar series which provides the students with both an overview of different aspects of microengineering and with a deeper insight in the specific techniques for the most common application areas.

• The first set of seminars deal with an introduction to the field, the fabrication of microsystems and the fundamental physical effects utilized within microengineering.

• Thereafter second set of lectures give a detailed overview of microsensors for quantifying position, tension, acceleration, temperature, pressure, and flow.

- The last set of seminars illustrate the use of microsystems in various applications (i.e. medical systems, automotive systems, etc).
- Moreover, a guest lecturer from industry describes how micromechanic components are manufactured on an industrial scale and gives insight into how microsystems can be commercialized.
- Yet another guest lecturer will give an introduction to the related emerging field of nanotechnology.

Disposition

Group assignments will be handed out in relation to the seminars in order to stimulate further studies of the different topics. The assignments will be corrected and the result will count towards the course grade.

The final exam will test on the content of seminars and group assignments. The result counts towards the course grade.

A project laboration including clean-room based manufacturing and evaluation of microsystem technology component and a mandatory industry site visit at a company fabricating microsystem components give concrete examples.

Course literature

Material som utdelas under kursens gång.

Lecture notes provided be the department

Equipment

None

Examination

- INL3 - Written Assignment, 4.0 credits, grading scale: A, B, C, D, E, FX, F
- LAB3 - Laboration, 0.5 credits, grading scale: P, F
- NÄR3 - Presence, 2.0 credits, grading scale: P, F
- TEN3 - Written Exam, 1.0 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.

Other requirements for final grade

To pass the course, the following is required

- Mandatory presence in at least 80% of the seminars and at the comulsory study visit (NÄR3).
- A clean-room laboration (LAB3).
- A passing grade on the written exam (TEN3), mainly testing learning outcomes 1 and 2 (TEN3). This will be graded and contributes to course grade.
- Passing grade on the group assignments that mainly tests learning outcomes 3, 4 and 5 as well as a written laboration report (INL3). These will be graded and contributes to the course grade.

The course grade is a based on the grades on the written exam and the group assignments such that the group assignment grade contributes more.

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.