

Project Course in Physics - Design and Fabrication of Sensor Chip, CDIO

Programme course

12 credits

Projektkurs i fysik, design, tillverkning och test av
sensor-chip, CDIO

TFYA51

Valid from: 2017 Spring semester

Determined by
Board of Studies for Electrical
Engineering, Physics and Mathematics

Date determined
2017-01-25

Main field of study

Applied Physics, Physics

Course level

Second cycle

Advancement level

A1X

Course offered for

- Applied Physics and Electrical Engineering, M Sc in Engineering
- Materials Science and Nanotechnology, Master's programme
- Applied Physics and Electrical Engineering - International, M Sc in Engineering

Specific information

The Entrepreneurship part overlap with other CDIO courses and cannot be included more than once in a degree.

Exchange students may apply for the course after arrival to LiTH but before it starts. The international officer for exchange studies must be contacted before applying.

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

The knowledge from the following courses is desirable, but not compulsory: Semiconductor technology, Microchip fabrication, Semiconductor physics, Surface physics, Materials physics, Sensor technology, Bio-analytical methods, Contemporary sensor systems

Intended learning outcomes

The goal of the course is to provide an interdisciplinary and integrated education, and bring the students closer to the real engineering world by means of a project work on a practical product – sensor devices - with large innovation and application possibilities. After the course, the students should be enriched in their professional engineering knowledge and skills related to the project work, and to the understanding of the technical importance and strategic value of their work. Furthermore, the course should also provide the students the infrastructure for the project management (linked with the use of LIPS), such that the students will be able to work as a team in a project in an industry-like environment. A purpose for the course is also for the students to acquire knowledge and abilities within the general area of entrepreneurship, with particular focus on business planning for new ventures. After the course, students should be able to:

- account for models that describe what it takes for a new venture to have a stable basis for further development and to assess the level of development of ventures using such models; and
- account for the information and analyses needed to evaluate a development project from a business point of view and have the ability to collect and analyse relevant information for the purpose.

Course content

The sensors in this project will be of high technological and commercial value with applications for example for monitoring of emissions in car exhausts or in flue gases from boilers. 15 hr of lectures, students will learn about the work background, work methods, and some basic knowledge required for the project work, including

1. wide bandgap semiconductor physics,
2. device physics and processing technology,
3. thin film technology,
4. sensor physics, detection mechanisms including surface catalytic reactions, etc.
5. data collection and data evaluation

The project work starts with a general investigation to understand the R & D background, technological and social demands, and required new innovations of the sensor devices to be used in the dedicated sensor system: (

1. The students design the device layout and the process flow, and perform a proper choice of the substrate and gate materials
2. They take part in material characterization, processing of components, and the mounting of the sensors
3. They characterize the sensors through measurements and evaluation of sensor functions and characteristics.
4. Finally the students should provide a general discussion about the usefulness of the sensors in a real application like control of the combustion in car exhausts or in the flue gases of domestic boilers.

Teaching and working methods

The course follows the "Conceive Design Interact Operate (CDIO)" program at LiU and the project model "Linköping Interactive Project Steering (LIPS)" is used. A number of introductory lectures in the beginning give basic knowledge for the project work. Then the students are organized in several groups, and devote most of their time to complete a project on a particular sensor device which is developed and tested in the research lab. The course runs over the entire autumn semester.

Examination

UPG1 Entrepreneurship assignments	3 credits	U, G
PRA1 Group working report and conference presentation followed by	9 credits	U, G

The work of the group is presented in written reports, which follow the LIPS documents, a poster and an oral presentation at a project conference, where the group will also answer questions about the project. Grades are given as 'Fail' or 'Pass'.

Grades

Two-grade scale, U, G

Department

Institutionen för fysik, kemi och biologi

Director of Studies or equivalent

Magnus Johansson

Examiner

Donatella Puglisi

Course website and other links

<http://www.ifm.liu.se/undergrad/fysikgtu/coursepage.html?selection=all&sort=kk>

Education components

Preliminary scheduled hours: 42 h

Recommended self-study hours: 278 h

Course literature

Additional literature

Other

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://stydokument.liu.se/Regelsamling/Innehall/Utbildning_pa_grund-_och_avancerad_niva.