LUND UNIVERSITY | LTH FACULTY OF ENGINEERING

Nanoscience Structure and courses

YEAR 1

STUDY PERIOD 1 – MANDATORY COURSES

FFFF10 - PROCESSING AND DEVICE TECHNOLOGY, 7.5 CREDITS

The purpose of this course is to provide fundamental knowledge about fabrication and characterization of semiconductor devices on the nanometer scale. The focus is set on modern materials and processing techniques with nanotechnology as a main theme. Most of the processes are general and are applied in traditional Si based IC technology as well as in advanced III-V technology and MEMS/NEMS fabrication.

Syllabus for FFFF10

FFFN30 - SEMICONDUCTOR PHYSICS, 7.5 CREDITS

The course aims for the student to develop a deeper understanding of the physical principles that form the basis of semiconductor physics and which is of central importance for understanding function of semiconductor devices, in particular transistors. An understanding of fundamental semiconductor physics and of the properties of semiconductor materials is crucial in order to be able to evaluate options regarding components and in order to be able to follow and take part in the development within the field.

Syllabus for FFFN30

STUDY PERIOD 2- MANDATORY COURSES

KASF15 - MATERIALS ANALYSIS AT NANOSCALE, 7.5 CREDITS

The student should acquire an active base of knowledge on methods for morphological, structural and elemental analysis on a nanometer scale. Also, the student should understand the mechanisms behind the different analysis methods.

Syllabus for KASF15

FFFN35 - THE PHYSICS OF LOW DIMENSIONAL STRUCTURES, 7.5 CREDITS

This course concerns artificial materials with substructure on the nanometer scale such that the electronic motion is restricted to two, one or zero dimensions. The emphasis is on semiconductor heterostructures but also other low-dimensional systems will be discussed. The concepts and the underlying theory are introduced based on quantum mechanics and extended by the application to heterostructures. After the lecture part of the course is completed, the student will work on a project within a research group for about 1.5 weeks. The project work will be presented orally as well as in writing.

Syllabus for FFFN35

STUDY PERIOD 3 AND 4

The second and third semesters, the students choose elective courses to form a specialisation. The courses are selected after discussions with the programme director. The amount of elective courses should in total correspond to 60 hp of which at least 30 hp should be from the table below.

Examples of specialisations:
These specialisations are based on the elective courses listed on page 3.

Bio-sensors: Micro sensors, Atomic and molecular spectroscopy, Optoelectronics and optical communication, Advanced processing of nanostructures, Statistical mechanics, The physics of surfaces, Experimental biophysics.

Nanophysics: Quantum information, Light-matter interaction, Solid state theory, Optoelectronics and optical communication, Advanced processing of nanostructures, Quantum mechanics (advanced course), Statistical mechanics, The physics of surfaces.

Materials science: Aerosol technology, Experimental methods and instrumentation for synchrotron radiation research, Crystal growth and semiconductor epitaxy, Advanced processing of nanostructures, Nano mechanics and multiscale modelling, Statistical mechanics, Nanomaterials – thermodynamics and kinetics, Aerosol technology project.

YEAR 2

All of year 2 is following the specialisation and is made up of elective courses (30 HP) and the Degree project (30 HP).

To stimulate interdisciplinarity, students are encouraged to also study other relevant courses, provided that the student fulfils the course prerequisites. Students whose Bachelor exam includes for instance chemistry, biology or electronics will thus have the opportunity to design specialisations according to their specific interests. Again, the selection of courses should be done together with the programme director and at least 30 hp should come from the below list of elective courses. The specialisation concludes with a diploma project. The extent of the diploma project: 30 hp, corresponds to full time studies during the fourth semester but it is quite often started in parallel with the courses in the third semester. During the diploma project, the student will be an active member in a research group, conducting research on an advanced level.

The degree project should finish at the end of the Spring semester but can either be taken all of Spring (30 HP) or divided to include 7.5 HP in study period 2 (second part of autumn semester), 7.5 HP in study period 3 (first part of spring semester) and then finish with 15 HP in study period 4 (second part of spring semester) and graduation that spring.

ELECTIVE COURSES

CODE	COURSE NAME	HP	LEVEL
EEMN01	Micro sensors	7.5	A
EITN35	Advanced Course in Electrical and Information Technology	7.5	A
EITP01	High Speed Devices	7.5	A
EITP05	Nanoelectronics	7.5	A
ETIA10	Patent and Intellectual Property Rights	7.5	G
EXTF90	Photon and Neutron Production for Science	7.5	G
EXTN90	Experimental Methods and Instrumentation for Synchrontron Radiation Research	7.5	A
EXTP90	Solid State Theory	7.5	A
EXTP95	The physics of Surfaces	7.5	A
FAFN05	Light-Matter Interaction	7.5	A
FAFN15	Chrystal Growth and Semiconductor Epitaxy	7.5	A
FAFN25	Atomic and Moeldular Spectroscopy	7.5	A
FAFN40	Quantum Information	7.5	A
FFFN01	Advanced Processing of Nanostructures	7.5	A
FFFN05	Nanomaterials - Thermodynamics and Kinetics	7.5	A
FFFN20	Experimental Biophysics	7.5	A
FFFN25	Optoelectronics and Optical Communication	7.5	A
FHLN10	Modern Experimental Mechanics	7.5	A
FMEN25	Nano Mechanics and Multiscale Modelling	7.5	A
FMFN01	Quantum Mechanics, Advanced Course 1	7.5	A
FMFN25	Statistical Mechanics	7.5	A
MAMF55	Aerosol Technology	7.5	G
MAMN20	Aerosol Technology Project	7.5	A