



Programme syllabus

Master's Programme, Nanotechnology, 120 credits

Masterprogram, nanoteknik

120.0 credits

Valid for students admitted to the education from autumn 19 (HT - Autumn term; VT - Spring term).

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

Programme objectives

The program aims to establish an understanding of size-dependent materials, device and system properties, and the other way around, how these properties can be tailored by a controlled manipulation of the microstructure down to the atomic or molecular level. Furthermore, it aims for a good knowledge of various nano-scale devices as well as their applications and fabrication methods. Special emphasis is also paid to the understanding and usage of advanced characterization methods to assess detailed materials and device properties.

Knowledge and understanding

For a master's degree in Nanotechnology the student shall:

- show knowledge and understanding in the area of Nanotechnology, comprising a wide knowledge of the area as well as more profound knowledge of some parts of the area, and insight into current research and development work
- show a deepened understanding of the various methodologies applied in Nanotechnology
- give examples of and explain social, ethical and environmental aspects of sustainable development in the area of Nanotechnology.

Skills and abilities

For a master's degree in Nanotechnology the student shall:

- show ability to critically and systematically integrate knowledge and to analyze, evaluate and handle complex occurrences, issues and situations even with limited information
- show ability to critically, independently and creatively identify and formulate issues, to plan and with adequate methods perform qualified tasks within given time limits and thereby contribute to the evolution of knowledge as well as assess the work
- show ability, in domestic and international venues, to orally and in writing present and discuss conclusions and the knowledge and the arguments on which these are based, in dialogue with different groups
- show such skills which are required for participation in research and development work or in other independent work of a qualified nature
- based on various definitions of sustainable development illustrate and point out perspectives where progress within Nanotechnology can be relevant for sustainable development in society
- understand the concept of sustainable use of finite resources and be able to demonstrate how this is implemented in the introduction of new nanomaterials.

Ability to make judgements and adopt a standpoint

For a master's degree in Nanotechnology the student shall:

- show ability to make assessments taking into account relevant scientific, societal and ethic aspects as well as show awareness of ethical aspects of research and development work
- show insight into the possibilities and limitations of science, its role in society and the responsibility of humans for its use
- show ability to compare and evaluate possibilities and limitations of Nanotechnology in the society and how Nanotechnology is used from a sustainability perspective.
- show insight into the risks of nanotechnology from an environmental and health perspective
- show ability to identify her/his need for additional knowledge and take responsibility for the development of his /her own knowledge.

Extent and content of the programme

Extent: 2 years (120 credits).

Level of education: Second-Cycle.

Language of education: English.

Specialisations: The program doesn't offer any formal specialisations, but depending on the choices of eligible courses it is possible to have a profile towards Nanoelectronics and Nanomaterials.

Eligibility and selection

General admission requirements and the following special admission requirements must be fulfilled in order to be admitted: Bachelor's degree in Physics, Electrical Engineering, Materials science, Chemistry or equivalent degree. Courses in mathematics corresponding to at least 20 ECTS credits, courses in physics corresponding to at least 30 ECTS credits.

The specific requirements may be assessed as not fulfilled if:

- The degree awarding institution is not considered to meet acceptable quality standards by the authorities of the country in which the institution is located.
- The degree does not qualify for admission to equivalent Master level in the country where the degree is awarded.

The selection process is based on the following selection criteria: University, previous studies (for instance GPA, grades in specific subjects and English), motivation for the studies (for instance letter of motivation, references, thesis proposal and relevant work experience). The evaluation scale is 1-75.

Implementation of the education

Structure of the education

Each academic year consists of two semesters which are 20 weeks each, and each semester is further divided into two study periods.

The program spans over two years, where the first three semesters are devoted to course work, whereas the final semester is aimed for the diploma work. The courses are either compulsory or eligible, where the specific choice in the latter case provides a possibility for profiling towards Nanoelectronics or Nanomaterials. The nanomaterials track offers an opportunity for a sustainability profile. Courses with such learning outcomes are also optional for the Nanoelectronics track and are included in the compulsory course Introduction to Nanotechnology. The fourth semester is dedicated for the thesis project.

Courses

The programme is course-based. Lists of courses are included in [appendix 1](#).

Grading system

Courses in the first and the second cycle are graded on a scale from A to F. A-E are passing grades, A is the highest grade. The grades pass (P) and fail (F) are used for courses under certain circumstances.

Grading scale is found in the course syllabus.

Conditions for participation in the programme

Participation requires admission to courses within the programme and course registration.

For further studies, special admission requirements for the course are to be fulfilled. Special admission requirements are listed in the respective course syllabus.

Degree project

The degree project is the final part of the education. The project work may begin when special admission requirements for the course are fulfilled.

Degree

Degree is entitled “Teknologiemasterexamen” - Master of Science. The main field of study is stated in the text on the degree certificate. The text on the degree certificate states the educational programme, Nanotechnology, completed by the student.

[Appendix 1 - Course list](#)

[Appendix 2 - Programme syllabus descriptions](#)



Appendix 1: Course list

Master's Programme, Nanotechnology, 120 credits (TNTEM), Programme syllabus for studies starting in autumn 2019

General courses

Year 1

Mandatory courses (37.5 credits)

Course code	Course name	Credits	Edu. level
IH2652	Methods and Instruments of Analysis	7.5	Second cycle
IH2659	Nanofabrication Technologies	7.5	Second cycle
SK2770	Introduction to Nanotechnology	5.0	Second cycle
SK2771	Solid State Physics	5.0	Second cycle
SK2772	Chemistry for Nanotechnology	5.0	Second cycle
SK2901	Quantum Materials and Devices	7.5	Second cycle

Year 2

Mandatory courses (37.5 credits)

Course code	Course name	Credits	Edu. level
AK2036	Theory and Methodology of Science with Applications (Natural and Technological Science)	7.5	Second cycle
IF246X	Degree Project in Engineering Physics, Second Cycle	30.0	Second cycle

Track, Nanomaterials (NTEA)

Year 1

Mandatory courses (37.5 credits)

Course code	Course name	Credits	Edu. level
IH2652	Methods and Instruments of Analysis	7.5	Second cycle

Course code	Course name	Credits	Edu. level
IH2659	Nanofabrication Technologies	7.5	Second cycle
SK2770	Introduction to Nanotechnology	5.0	Second cycle
SK2771	Solid State Physics	5.0	Second cycle
SK2772	Chemistry for Nanotechnology	5.0	Second cycle
SK2901	Quantum Materials and Devices	7.5	Second cycle

Conditionally elective courses

Course code	Course name	Credits	Edu. level
BB2400	Bionanotechnology	7.5	Second cycle
SK2773	Nanothermodynamics	7.5	Second cycle
SK2774	Colloids and Colloidal Principles for Applications	7.5	Second cycle

Year 2

Mandatory courses (37.5 credits)

Course code	Course name	Credits	Edu. level
AK2036	Theory and Methodology of Science with Applications (Natural and Technological Science)	7.5	Second cycle
IF246X	Degree Project in Engineering Physics, Second Cycle	30.0	Second cycle

Conditionally elective courses

Course code	Course name	Credits	Edu. level
SK2757	Project on Nanomaterials	7.5	Second cycle
SK2760	Chemistry of Nanomaterials	7.5	Second cycle
SK2775	Nanomaterials for Sustainable Energy and Environment	7.5	Second cycle

Track, Nanoelectronics (NTEB)

Year 1

Mandatory courses (37.5 credits)

Course code	Course name	Credits	Edu. level
IH2652	Methods and Instruments of Analysis	7.5	Second cycle
IH2659	Nanofabrication Technologies	7.5	Second cycle
SK2770	Introduction to Nanotechnology	5.0	Second cycle
SK2771	Solid State Physics	5.0	Second cycle
SK2772	Chemistry for Nanotechnology	5.0	Second cycle
SK2901	Quantum Materials and Devices	7.5	Second cycle

Conditionally elective courses

Course code	Course name	Credits	Edu. level
EK2350	Microsystem Technology	7.5	Second cycle
IH1611	Semiconductor Devices	7.5	First cycle
IH2657	Design of Nano Semiconductor Devices	7.5	Second cycle

Year 2

Mandatory courses (37.5 credits)

Course code	Course name	Credits	Edu. level
AK2036	Theory and Methodology of Science with Applications (Natural and Technological Science)	7.5	Second cycle
IF246X	Degree Project in Engineering Physics, Second Cycle	30.0	Second cycle

Conditionally elective courses

Course code	Course name	Credits	Edu. level
EK2360	Hands-On Microelectromechanical Systems Engineering	7.5	Second cycle
IH2653	Simulation of Semiconductor Devices	7.5	Second cycle
IL2238	Fundamentals of Integrated Electronics	7.5	Second cycle
SK2822	Compound Semiconductors and Photonic Devices	7.5	Second cycle



Appendix 2: Specialisations

Master's Programme, Nanotechnology, 120 credits (TNTEM), Programme syllabus for studies starting in autumn 2019

Track, Nanomaterials (NTEA)

Track, Nanomelectronics (NTEB)