Programme syllabus

Master's Programme, Nanotechnology, 120 credits
Masterprogram, nanoteknik
120.0 credits

Valid for students admitted to the education from autumn 13 (HT - Autumn term; VT - Spring term).

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

Programme objectives

Based on a solid understanding of basic materials science and solid state physics 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, and
- show a deepened understanding of the various methodologies applied in 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 asses 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, and
- show such skills which are required for participation in research and development work or in other independent work of a qualified nature.

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 identify her/his need for additional knowledge and take responsibility for the development of his/her own knowledge.

The KTH general examination policy is described in the KTH Handbook, part 2, sec. 19.1.

Extent and content of the programme

Extent: 2 years (120 credits)
Level of education: Advanced
Specializations: The program doesn’t offer any formal specializations, but depending on the choices of eligible courses it is possible to have a profile towards Nanoelectronics, Nanomaterials or
Nanophysics
Language of education: English

Eligibility and selection

The KTH general admission requirements are described in the KTH handbook, part 2, sec. 11.5

Special requirements:
Bachelor's degree in Physics, Electrical Engineering, Materials science, Chemistry or equivalent degree. Courses in mathematics corresponding to at least 30 ECTS credits, courses in physics corresponding to at least 60 ECTS credits. The mathematics course contents should include vector and Fourier analysis, probability density functions and partial differential equations.

The specific requirements may be assessed as not fulfilled if
1. The average grade is in the lower third on the grading scale used (above pass level).
2. The degree awarding institution is not considered to meet acceptable quality standards by the authorities of the country in which the institution is located.
3. The degree does not qualify for admission to equivalent Master level in the country where the degree is awarded.

Selection process:
The selection process for the Nanotechnology programme is based on a total evaluation of the following selection criteria: university, GPA, course work related to the programme, and to a minor extent: thesis proposal, working experiences and references.

Implementation of the education

Structure of the education

Information regarding the academic year, study periods, etc, can be found in the KTH handbook, part 2, sec. 4.2, or at the student web pages: www.kth.se/student/schema

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, Nanomaterials or Nanophysics.

Courses

The programme is course-based. Lists of courses are included in appendix 1.

The program course list is given 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.

KTH applies a grading scale with seven levels A-F for the final grade for courses at the advanced level. A-E are passing grades where A is the highest. The grades pass (P) and fail (F) may be used in special cases.

Conditions for participation in the programme

Registration for each semester as well as selection of elective courses is web-based and should be completed by November 15 and May 15.

Promotion to the second year of studies is conditional that at least 75% of the requirements for the first year is completed.

Course registration is compulsory and should be done with the course responsible at the beginning of each course.

Recognition of previous academic studies

Possible transfer of credits from previous course work follows the KTH policy described in the KTH handbook, part 2, sec. 13.3.

Studies abroad

The diploma work as well as course work corresponding to maximum 30 credits may be carried out at a foreign university following approval of the program responsible. In this case a so-called “Learning agreement” must be established.

Degree project

General rules and policies regarding the diploma work and its grading can be found in the KTH handbook, part 2, sec. 15.5.

The diploma work amounts to 30 credits, which should equal 20 weeks of full time studies. A student may apply for starting a thesis project given that most of the course work has been accomplished, corresponding to 60 credits out of which at least 30 credits at the advanced level within the major subject of the program.

The thesis topic should be relevant to the nanotechnology field.

The thesis is graded on the scale A-F according to the KTH’s polices.

Degree

KTHs procedure for awarding degrees is described in the KTH handbook, part 2, sec. 19.1.

The Masters degree is awarded after fulfilling all requirements defined by the program. This includes a total of 120 credits out of which 90 credits are at the advanced level and at least 60 credits (including 30 credits for the thesis work) corresponds to advanced level courses within the major subject of the program.

The name of the degree is “Teknologie Mastersexamen”, which in English translates to “Degree of Masters of Science (two years)”. The program name, Nanotechnology, is indicated on the diploma.

An application for the degree must be filed by the student and should be directed to the ICT educational office.
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 2013

General courses

Year 1

Mandatory courses (37.5 credits)

Course code	Course name	Credits	Edu. level
AK2036	Theory and Methodology of Science with Applications (Natural and Technological Science) *May instead be taken during the second year if IH2654 is taken to improve or rehearse the knowledge in basic quantum mechnics*	7.5	Second cycle
IH1611	Semiconductor Devices	7.5	First cycle
IH2652	Methods and Instruments of Analysis	7.5	Second cycle
IM2655	Introduction to Nanomaterials and Nanotechnology	7.5	Second cycle
IM2660	Solid State Physics	7.5	Second cycle

Conditionally elective courses

Course code	Course name	Credits	Edu. level
BB2400	Bionanotechnology	7.5	Second cycle
EK2350	Microsystem Technology	7.5	Second cycle
IH2655	Design and Characterisation of Nano- and Microdevices	7.5	Second cycle
IH2656	Advanced Semiconductor Materials	7.5	Second cycle
IH2657	Design of Nano Semiconductor Devices	7.5	Second cycle
IM2653	Molecular Electronics	7.5	Second cycle
SI2635	Introductory Condensed Matter Theory	7.5	Second cycle

Supplementary information

Diploma work on advanced level 30 cr is mandatory during the spring term.

Year 2

Conditionally elective courses

Course code	Course name	Credits	Edu. level
BB2410	Molecular Biotechnology for Nanotechnology	7.5	Second cycle
EK2360	Hands-On Microelectromechanical Systems Engineering	7.5	Second cycle
IH2653	Simulation of Semiconductor Devices	7.5	Second cycle
IH2654	Nanoelectronics *Can also be taken during the first year as an introduction to or rehearsal in basic quantum mechanics*	9.0	Second cycle
IM2659	Project on Nanomaterials	7.5	Second cycle
IM2661	Superconductivity and Applications	6.0	Second cycle
IM2665	Chemistry of Nanomaterials	7.5	Second cycle
IM2666	Characterization of Nanomaterials	7.5	Second cycle
IM2667	Physics and Chemistry of Surfaces	7.5	Second cycle
SI2380	Advanced Quantum Mechanics	7.5	Second cycle
SI2510	Statistical Mechanics	7.5	Second cycle
SI2600	Condensed Matter Theory	7.5	Second cycle
SK2700	Mesoscopic Physics	8.0	Second cycle

Appendix 2: Specialisations

Master's Programme, Nanotechnology, 120 credits (TNTEM), Programme syllabus for studies starting in autumn 2013

This programme has no specialisations.