



Programme syllabus

Master's Programme, Nanotechnology, 120 credits

Masterprogram, nanoteknik

120.0 credits

Valid for students admitted to the education from autumn 09 (HT - Autumn term; VT - Spring term).

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

Programme objectives

The master's programme in Nanotechnology aims to, starting from a broad base in fundamental material science and solid-state physics, build up an understanding of micro structures' meaning for material, component, and system properties, and, reversely, how these properties can be affected through a manipulation of the micro-structure on atomic or molecular scales. Furthermore, the programme aims to provide a good awareness about different nanocomponents and their applications and manufacturing technology. In addition, heavy focus is put on understanding and management of advanced analysis methods for material as well as component properties. In a more general perspective, the goals are formulated according to the national degree ordinance:

Knowledge and understanding

For the Master's degree in Nanotechnology, the student should:- show knowledge and understanding within nanotechnology, including broad knowledge within the area as well as essentially deepened knowledge within certain parts of the area and a deeper insight to current research and development work- show deepened method knowledge within nanotechnology

Skills and abilities

For the master's degree in Nanotechnology, the student should:- show the ability to critically and systematically integrate knowledge and to analyse, assess, and handle complex phenomena, inquiries, and situations even with limited information.- show the ability to critically, independently and creatively identify and formulate, inquiries, to plan and, with adequate methods, carry out qualified assignments within given time constraints and, through that, contribute to the knowledge development and to evaluate this work- show the ability to, in both a national and international environment, orally and in writing, clearly present and discuss one's conclusions and the knowledge and arguments which are the foundation for these, in dialogue with different groups- show the ability to participate in research and development work such that it is possible to carry out independent work in another qualified workplace.

Ability to make judgements and adopt a standpoint

For the Master's degree in Nanotechnology, the student should:- show the ability to, within the nanotechnology area, make judgments with regards to relevant scientific, social and ethical aspects and show awareness about ethical aspects in research and development work.- show insight about science's possibilities and limitations, its role in society and humans' responsibility for how it is used- show the ability to identify one's own need for further knowledge and take responsibility for the development of this knowledge *KTH's local degree ordinance is described in the KTH-handbook, part 2, page 19.1*

Extent and content of the programme

Extent: 2 years (120 higher education credits) Programme level: second Specialisations: the programme has no formal specialisations but offers the possibility to choose between three concentrations: *nanoelectronics, nanomaterials, or quantum materials* Language of instruction: English

Eligibility and selection

Basic eligibility for the second level according to KTH's admission policy (the KTH handbook, part 2, page 11.5) Special eligibility requirements: A Bachelor degree in physics, material science, chemistry or equivalent degree. Passing courses in mathematics corresponding to at least 30 higher education credits, and passing courses in physics corresponding to 60 higher education credits. The mathematics courses should include courses in vectors and Fourier-analysis, probability distribution functions and partial differential equations. *Selection:* The selection process is based on the combination of factors: the home university's quality, grades, undergraduate courses' relevance for the programme, and, with less weight, work experience and references.

Implementation of the education

Structure of the education

Information about study years, terms, study periods can be found in the KTH-handbook (part 2, page 4.2) and on the student web (www.kth.se/student/schema). The programme is a two year programme where the first three terms include courses while the fourth term is reserved for the degree project. Term 1 includes only obligatory courses which are common for all students in the programme. Terms 2 and 3 include obligatory courses as well as optional courses which gives the student the possibility to profile him/herself in *Nanoelectronics, Nanomaterials or Quantum materials*. In term 4 the degree project is carried out.

Courses

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

The programme occurs in course form. The course lists can be found in Appendix 1. Up to 10 higher education credits of completely optional courses can be counted toward the degree under the secondary condition that at least 90 higher education credits are on the second level, whereof at least 60 higher education credits (including 30 higher education credits of degree project work) are in concentrated within the main area for the programme.

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.

Conditions for participation in the programme

Term enrolment and course selection for the coming term occur through KTH's website at the latest November 15th and May 15th respectively. The conditions for being promoted to study year two: at least 75% (45 higher education credits) of course elements in study year 1 are fulfilled. Course registration is done to the course responsible at the beginning of each individual course.

Recognition of previous academic studies

Possible recognition follows KTH's policy which is described in the KTH handbook, part 2, page 13.3. The following mandates apply: In accordance with KTH's work order, the GA decides about recognition of entire courses. Decisions about recognition of entire courses can be delegated to the programme responsible teacher if the school has such a person. Recognition of a part of a course can be delegated to the examiner.

Studies abroad

The degree project and course corresponding maximally 30 higher education credits can be taken at foreign universities with the permission of the head of the programme and after a, so called, "Learning agreement" has been created.

Degree project

General rules and guidelines for degree projects and grading of degree projects can be found in the KTH-handbook, part 2, page 15.5 The degree project comprises 30 higher education credits which correspond to 20 weeks of full-time studies. Conditions to start the degree project is that the main portion of the studies, corresponding to 60 higher education credits, with a concentration on the second level within the main subject, must be completed. The degree project must be carried out within the main area for the education. The degree project must be given a grade according to the A-F scale, based on three KTH-common assessment criteria: Engineer-related and scientific content, process, and presentation.

Degree

KTH's local degree ordinance can be found in the KTH-handbook, part 2, page 19.1. The Master's degree is received after completing the education programme. The programme must be formed so that the student, at the time of graduation, fulfilled the national degree requirements and has completed courses comprising 120 higher education credits, whereof at least 90 higher education credits were on the second level, whereof 60 higher education credits (including 30 higher education credits of degree project work) with a concentration within the main area for the programme. Examen benämns "Teknologie masterexamen". I examensbevisets textdel anges det utbildningsprogram som den studerande genomgått. The name of the degree is "Degree of Master of Science (2 years)". In the diploma, the name of the educational programme which the student has completed is stated in the text portion. The application for the degree is submitted to the ICT school's office.

[Appendix 1 - Course list](#)

[Appendix 2 - Programme syllabus descriptions](#)



Appendix 1: Course list

Programme syllabus for studies starting in autumn 2009, Master's Programme, Nanotechnology, 120 credits (TNTEM)

General courses

Year 1

Mandatory courses (52.5 Credits)

Code	Name	Credits	Edu. level
AK2036	Theory and Methodology of Science with Applications (Natural and Technological Science)	7.5 hp	Second cycle
IF1621	Quantum Mechanics I	7.5 hp	First cycle
IH2651	Semiconductor Theory and Device Physics, General Course	7.5 hp	Second cycle
IH2652	Methods and Instruments of Analysis	7.5 hp	Second cycle
IM2651	Physics of Electronic Materials	7.5 hp	Second cycle
IM2655	Introduction to Nanomaterials and Nanotechnology	7.5 hp	Second cycle
IM2660	Solid State Physics	7.5 hp	Second cycle

Conditionally elective courses

Code	Name	Credits	Edu. level
BB2400	Bionanotechnology	7.5 hp	Second cycle
EK2350	Microsystem Technology	7.5 hp	Second cycle
IH2655	Design and Characterisation of Nano- and Microdevices	7.5 hp	Second cycle
IH2656	Advanced Semiconductor Materials	7.5 hp	Second cycle
IH2657	Design of Nano Semiconductor Devices	7.5 hp	Second cycle
IM2653	Molecular Electronics	7.5 hp	Second cycle
IT2655	Frontiers of Microelectronics and Information Technology	6.0 hp	Second cycle

Year 2

Mandatory courses (7.5 Credits)

Code	Name	Credits	Edu. level
AK2036	Theory and Methodology of Science with Applications (Natural and Technological Science)	7.5 hp	Second cycle

Conditionally elective courses

Code	Name	Credits	Edu. level
BB2410	Molecular Biotechnology for Nanotechnology	7.5 hp	Second cycle
IF2692	Statistical Physics	7.5 hp	Second cycle
IH2653	Simulation of Semiconductor Devices	7.5 hp	Second cycle
IH2654	Nanoelectronics	9.0 hp	Second cycle
IH2658	Semiconductor Theory and Device Physics, Advanced Course	6.0 hp	Second cycle
IM2652	Surface Physics, Basic Course	6.0 hp	Second cycle
IM2654	Smart Electronic Materials	6.0 hp	Second cycle
IM2657	Nanostructured Materials and Self Assembly	6.0 hp	Second cycle
IM2658	Experimental Techniques - Bulk	6.0 hp	Second cycle
IM2659	Project on Nanomaterials	7.5 hp	Second cycle
IM2661	Superconductivity and Applications	6.0 hp	Second cycle
IM2663	Magnetism and Magnetoelectronics	7.5 hp	Second cycle
SI2380	Advanced Quantum Mechanics	7.5 hp	Second cycle
SI2600	Condensed Matter Theory	7.5 hp	Second cycle
SK2700	Mesoscopic Physics	8.0 hp	Second cycle



Appendix 2: Specialisations

Programme syllabus for studies starting in autumn 2009, Master's Programme, Nanotechnology, 120 credits (TNTEM)

This programme has no specialisations.