



# Programme syllabus

Master's Programme, Nanotechnology, 120 credits

Masterprogram, nanoteknik

*120.0 credits*

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*Valid for students admitted to the education from autumn 12 (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 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, 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 KTH Regulations*

## **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 KTH Regulations*

*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.

English requirements

TOEFL paper based test, total of 575, 4.5 writing section

TOEFL internet based test, total of 90, 20 writing section

IELTS score of at least 6.5, no band lower than 5.5 (only academic training accepted)

*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 Regulations or at the student web pages: [www.kth.se/student/schema](http://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](#).

### **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**

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 KTH policy described in the KTH Regulations

## **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 Regulations. 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 policies.

## **Degree**

KTHs procedure for awarding degrees is described in the KTH Regulations

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 2012

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## General courses

### Year 1

#### Mandatory courses (30.0 Credits)

Course code	Course name	Credits	Edu. level
<a href="#">IH1611</a>	<a href="#">Semiconductor Devices</a>	7.5 hp	First cycle
<a href="#">IH2652</a>	<a href="#">Methods and Instruments of Analysis</a>	7.5 hp	Second cycle
<a href="#">IM2655</a>	<a href="#">Introduction to Nanomaterials and Nanotechnology</a>	7.5 hp	Second cycle
<a href="#">IM2660</a>	<a href="#">Solid State Physics</a>	7.5 hp	Second cycle

#### Conditionally elective courses

Course code	Course name	Credits	Edu. level
<a href="#">BB2400</a>	<a href="#">Bionanotechnology</a>	7.5 hp	Second cycle
<a href="#">EK2350</a>	<a href="#">Microsystem Technology</a>	7.5 hp	Second cycle
<a href="#">IH2655</a>	<a href="#">Design and Characterisation of Nano- and Microdevices</a>	7.5 hp	Second cycle
<a href="#">IH2656</a>	<a href="#">Advanced Semiconductor Materials</a>	7.5 hp	Second cycle
<a href="#">IH2657</a>	<a href="#">Design of Nano Semiconductor Devices</a>	7.5 hp	Second cycle
<a href="#">IM2653</a>	<a href="#">Molecular Electronics</a>	7.5 hp	Second cycle
<a href="#">MH2426</a>	<a href="#">Quantum Engineering Computations for Nanosystems</a>	7.5 hp	Second cycle
<a href="#">SI2635</a>	<a href="#">Introductory Condensed Matter Theory</a>	7.5 hp	Second cycle

### Year 2

#### Mandatory courses (7.5 Credits)

Course code	Course name	Credits	Edu. level
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[AK2036](#) [Theory and Methodology of Science with Applications \(Natural and Technological Science\)](#) 7.5 hp Second cycle

### Conditionally elective courses

<b>Course code</b>	<b>Course name</b>	<b>Credits</b>	<b>Edu. level</b>
<a href="#">BB2410</a>	<a href="#">Molecular Biotechnology for Nanotechnology</a>	7.5 hp	Second cycle
<a href="#">EK2360</a>	<a href="#">Hands-On Microelectromechanical Systems Engineering</a>	7.5 hp	Second cycle
<a href="#">IF2692</a>	<a href="#">Statistical Physics</a>	7.5 hp	Second cycle
<a href="#">IH2653</a>	<a href="#">Simulation of Semiconductor Devices</a>	7.5 hp	Second cycle
<a href="#">IH2654</a>	<a href="#">Nanoelectronics</a>	9.0 hp	Second cycle
<a href="#">IH2658</a>	<a href="#">Semiconductor Theory and Device Physics, Advanced Course</a>	6.0 hp	Second cycle
<a href="#">IM2652</a>	<a href="#">Surface Physics, Basic Course</a>	6.0 hp	Second cycle
<a href="#">IM2654</a>	<a href="#">Smart Electronic Materials</a>	6.0 hp	Second cycle
<a href="#">IM2657</a>	<a href="#">Nanostructured Materials and Self Assembly</a>	6.0 hp	Second cycle
<a href="#">IM2658</a>	<a href="#">Experimental Techniques - Bulk</a>	6.0 hp	Second cycle
<a href="#">IM2659</a>	<a href="#">Project on Nanomaterials</a>	7.5 hp	Second cycle
<a href="#">IM2661</a>	<a href="#">Superconductivity and Applications</a>	6.0 hp	Second cycle
<a href="#">SI2380</a>	<a href="#">Advanced Quantum Mechanics</a>	7.5 hp	Second cycle
<a href="#">SI2600</a>	<a href="#">Condensed Matter Theory</a>	7.5 hp	Second cycle
<a href="#">SK2700</a>	<a href="#">Mesoscopic Physics</a>	8.0 hp	Second cycle



## Appendix 2: Specialisations

Master's Programme, Nanotechnology, 120 credits (TNTEM),  
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This programme has no specialisations.