Programme syllabus

An accessible version of the syllabus can be found in the Course and programme directory.

Master's Programme, Nanotechnology 120 credits

Masterprogram, nanoteknik

Valid for students admitted to the education from autumn 11 (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
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 polices.

**Degree**

KTH’s 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 (TNTEM)

General courses

Year 1

Mandatory courses (37.5 Credits)

<table>
<thead>
<tr>
<th>Code</th>
<th>Name</th>
<th>Credits</th>
<th>Edu. level</th>
</tr>
</thead>
<tbody>
<tr>
<td>IF1621</td>
<td>Quantum Mechanics I</td>
<td>7.5 hp</td>
<td>First cycle</td>
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<tr>
<td>IH1611</td>
<td>Semiconductor Devices</td>
<td>7.5 hp</td>
<td>First cycle</td>
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<tr>
<td>IH2652</td>
<td>Methods and Instruments of Analysis</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>IM2655</td>
<td>Introduction to Nanomaterials and Nanotechnology</td>
<td>7.5 hp</td>
<td>Second cycle</td>
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<tr>
<td>IM2660</td>
<td>Solid State Physics</td>
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## Conditionally elective courses

<table>
<thead>
<tr>
<th>Code</th>
<th>Name</th>
<th>Credits</th>
<th>Edu. level</th>
</tr>
</thead>
<tbody>
<tr>
<td>BB2400</td>
<td>Bionanotechnology</td>
<td>7.5 hp</td>
<td>Second cycle</td>
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<tr>
<td>EK2350</td>
<td>Microsystem Technology</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>IH2655</td>
<td>Design and Characterisation of Nano- and Microdevices</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>IH2656</td>
<td>Advanced Semiconductor Materials</td>
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<td>Second cycle</td>
</tr>
<tr>
<td>IH2657</td>
<td>Design of Nano Semiconductor Devices</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>IM2653</td>
<td>Molecular Electronics</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>MH2426</td>
<td>Quantum Engineering Computations for Nanosystems</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>SI2635</td>
<td>Introductory Condensed Matter Theory</td>
<td>7.5 hp</td>
<td>Second cycle</td>
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</table>

## Year 2

### Mandatory courses (7.5 Credits)

<table>
<thead>
<tr>
<th>Code</th>
<th>Name</th>
<th>Credits</th>
<th>Edu. level</th>
</tr>
</thead>
<tbody>
<tr>
<td>AK2036</td>
<td>Theory and Methodology of Science with Applications (Natural and Technological Science)</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
</tbody>
</table>
## Conditionally elective courses

<table>
<thead>
<tr>
<th>Code</th>
<th>Name</th>
<th>Credits</th>
<th>Edu. level</th>
</tr>
</thead>
<tbody>
<tr>
<td>BB2410</td>
<td>Molecular Biotechnology for Nanotechnology</td>
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<td>Second cycle</td>
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<tr>
<td>EK2360</td>
<td>Hands-On Microelectromechanical Systems Engineering</td>
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<td>Second cycle</td>
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<td>IF2692</td>
<td>Statistical Physics</td>
<td>7.5 hp</td>
<td>Second cycle</td>
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<tr>
<td>IH2653</td>
<td>Simulation of Semiconductor Devices</td>
<td>7.5 hp</td>
<td>Second cycle</td>
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<tr>
<td>IH2654</td>
<td>Nanoelectronics</td>
<td>9.0 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>IH2658</td>
<td>Semiconductor Theory and Device Physics, Advanced Course</td>
<td>6.0 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>IM2652</td>
<td>Surface Physics, Basic Course</td>
<td>6.0 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>IM2654</td>
<td>Smart Electronic Materials</td>
<td>6.0 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>IM2657</td>
<td>Nanostructured Materials and Self Assembly</td>
<td>6.0 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>IM2658</td>
<td>Experimental Techniques - Bulk</td>
<td>6.0 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>IM2659</td>
<td>Project on Nanomaterials</td>
<td>7.5 hp</td>
<td>Second cycle</td>
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<tr>
<td>IM2661</td>
<td>Superconductivity and Applications</td>
<td>6.0 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>SI2380</td>
<td>Advanced Quantum Mechanics</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>SI2600</td>
<td>Condensed Matter Theory</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>SK2700</td>
<td>Mesoscopic Physics</td>
<td>8.0 hp</td>
<td>Second cycle</td>
</tr>
</tbody>
</table>
Appendix 2: Specialisations

Master's Programme, Nanotechnology (TNTEM)

This programme has no specialisations.