Programme syllabus

Master's Programme, Macromolecular Materials, 120 credits
Masterprogram, makromolekylära material
120.0 credits

Valid for students admitted to the education from autumn 14 (HT - Autumn term; VT - Spring term).

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

Programme objectives

Knowledge and understanding

To receive a Degree of Master of Science in Macromolecular materials, the students should:

• demonstrate general knowledge and understanding concerning properties and use of different materials, including knowledge and understanding of material related environmental aspects.

• demonstrate in-depth knowledge on how macromolecular materials are build-up from molecular level to macroscopic level and the relationship between structure and material properties.

• demonstrate knowledge on synthesis/modification, characterization, processing and applications of polymer and/or fibre-based materials.

• have insight into current research front in macromolecular materials including the role of materials in sustainable society.

Skills and abilities

To receive a Degree of Master of Science in Macromolecular materials, the students should:

• demonstrate the skills to develop polymer and/or fibre based materials and the ability to identify, formulate and manage current and real material related problems drawn from industry, society and research, taking into account the potential and limitations of different raw materials, processes and materials and the goals of sustainable society.

• demonstrate the ability to make assessment of the reasonableness of the obtained solutions, and compare and evaluate alternative solutions.
• demonstrate laboratory skills and knowledge of safe chemical managing, and the ability to implement and evaluate material related experiments on a laboratory scale.

• demonstrate the ability to orally and in writing present and discuss ideas and outcomes and communicate them with persons with and without technical scientific background.

• demonstrate the ability to effectively work as an individual and as a team member to plan and implement projects within given timeframe.

• demonstrate the skills to use computer tools for information retrieval.

Abilities to make judgements and adopt a standpoint

To receive a Degree of Master of Science in Macromolecular materials, the students should:

• demonstrate the ability to critically review the literature and technologies in areas related to materials chemistry and particularly polymer and fibre-based materials.

• demonstrate the ability to take a stand on issues of ethical nature in their professional field.

• demonstrate an understanding for the fact that material related problems can be complex, incompletely defined and contain contradictory conditions

• demonstrate the ability to judge material related social, environmental and working-environmental aspects

• demonstrate the ability to rapidly acquire knowledge in new areas and to apply new knowledge for innovation and development of materials and related processes

Extent and content of the programme

Macromolecular Materials is a two-year (120 credits) master programme, second cycle. The instruction language is entirely English. The programme is divided into two tracks. The first track “Macromolecular Materials” consists of two years studies at KTH. The courses are given mainly by the School of Chemical Science and Engineering.

The second track “Nordic Master in Polymer Technology” - Nordic 5 Tech is a double degree programme given in co-operation with Nordic Five Tech Universities. The student will study one year (60 credits) at KTH and 1 year (60 credits) at Aalto University, Technical University of Danmark or Norwegian University of Science and Technology.

For more information, see www.n5poltech.org.

Eligibility and selection

General admission requirements
A completed Bachelor's degree - corresponding to a Swedish Bachelor's degree (180 credits), or equivalent academic qualifications from an internationally recognized university.
Language requirements – applicants must proof their proficiency in English, which is most commonly established through an internationally recognized test. Please note that the following TOEFL test score requirements are specific for Nordic Master in Polymer Technology: TOEFL: Paper-based: 580 (written section grade 4,5) or Internet-based test: 92 (written section grade 22).
For Nordic Master students please inform us, in your motivation letter, in which university you will study the second year; Aalto University, Technical University of Denmark or Norwegian University of Science and Technology.

Documentation – for detailed information about list of required documents, see “Admission requirements and selection”

Specific admission requirements
In order to be admitted to the Macromolecular Materials programme, a Bachelor's degree in Chemistry or closely related subject, of 180 credits, including the following is required:

• Courses in chemistry or closely related subject for at least 50 credits.
• Basic knowledge in mathematics, numerical analysis and computer science for at least 20 credits.

For more information, see Study at KTH, Master’s programmes at KTH, “Admission requirements”

Selection process
The selection process for the Macromolecular Materials programmes based on a total evaluation of the following selection criteria: university, grade point average (GPA), courses relevant to the programme, motivation letter, list of qualifications for specific requirements relevant work experience if any, and English proficiency.

Complete information on the eligibility requirements can be found in the local admission policy of KTH, see:

Implementation of the education

Structure of the education

The academic year has a duration of 40 weeks. The academic year at KTH is divided into four periods. Each period lasts approximately seven weeks and is followed by an examination period. The programme consists of courses for 90 credits courses followed by a degree project, advanced level of 30 credits.

For the Macromolecular Materials track
Two mandatory courses (15 credits) are included in the first year, and remaining courses may be chosen from a list of 25 courses. Within this list 5 courses are regarded as particularly important, and the student
is required to choose at least 3 of these 5. This gives the student a great opportunity to create his/her own curriculum. Guidelines and recommendations for course combinations will be given. Courses corresponding to 15 credits can be elected freely outside the course list.

**For the Nordic Master in Polymer Technology, Nordic 5 Tech track**

The first year at KTH will include an obligatory course package of 30 credits. The remaining 30 credits can be selected from the recommended list in agreement with the programme director to support the second year specialization. The second year at KTH will include an obligatory course package of 15 credits and a 30 credits master thesis. The remaining 15 credits can be selected from the recommended course list.

**Courses**

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

The programme consists of mandatory, conditionally elective, recommended and elective courses. The goals, prerequisites, contents and examination requirements of different courses can be found in the respective course plans.

Two or three courses are usually studied in parallel during each period. Teaching and examination methods vary between the courses. Normally the course contains lectures, which give an introduction to the concepts and theory. Exercises, seminars, laboratory work and project assignments deepen the conceptual understanding, give practical experience and give possibility to practice the group skills.

**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**

Students accepted to the programme will start the programme at the end of August when the registration also takes place. The student must register in person. The students are thereafter required to make a study registration and course selection for the coming term no later than November 15 and May 15 each academic year, respectively. At least 45 credits have to be completed during the first academic year (including the re-examination period in August) in order for the student to be promoted to the second year of the programme.

Students who have not passed 45 credits in the first year, must contact the educational coordinator for an individual study plan. This study plan will include residual courses and appropriate courses for the upcoming year. The student who has not done this will not be registered on any courses in the upcoming academic year.

**Recognition of previous academic studies**

Under certain circumstances, and in agreement with the programme coordinator, credits for previous studies can be received according to the local policy of KTH.
For more information see:

Studies abroad

For information about studies abroad, contact the international coordinator at the School of Chemical Science and Engineering.

Degree project

Students admitted to the programme are required to perform an individual study in the form of a degree project, advanced level, corresponding to 30 credits. This means 20 weeks of fulltime studies. The main portion of the studies must generally be completed before the degree project work can be started. At least 60 credits must be completed where 30 credits in the second cycle within the main field of study.

The purpose of the thesis project is that the student demonstrates the ability to perform independent project work, using the skills obtained from the courses in the programme. It is the student's responsibility to find a suitable thesis project, with assistance from KTH

More information on the KTH policy on the degree project can be found at:

Degree

Master of Science (120 credits) - is obtained after completion of the Master (Two Years), Macromolecular Materials study programme. The programme is designed so that students, when they graduate, have fulfilled national requirements for a degree and have completed courses comprising 120 credits, of which:

- At least 90 credits are at second cycle, of which at least 60 higher education credits (including a 30-credits degree project) with in-depth studies in the main field of study.

Students who fulfil all the requirements will be awarded a Master of Science (120 credits). Students must apply for the degree and also show proof of their basic degree (Bachelor or similar). To apply use the web service “Application for degrees” that is found in the personal menu.

Degree name

Master of Science (120 credits)
Teknologie masterexamen

http://intra.kth.se/regelverk/utbildning-forskning/grundutbildning/examina/1.27227?l=en_UK

Appendix 1 - Course list
Appendix 2 - Programme syllabus descriptions
Appendix 1: Course list

Master's Programme, Macromolecular Materials, 120 credits (TMMMM), Programme syllabus for studies starting in autumn 2014

General courses

Year 1

Mandatory courses (21.0 Credits)

<table>
<thead>
<tr>
<th>Course code</th>
<th>Course 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>
<tr>
<td>KD1230</td>
<td>Organic Chemistry, Basic Concepts and Practice</td>
<td>6.0 hp</td>
<td>First cycle</td>
</tr>
<tr>
<td>KF2110</td>
<td>Mechanical Properties of Materials</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>KD2150</td>
<td>Inorganic Materials Chemistry</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>KF2130</td>
<td>Polymer Chemistry</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>KF2140</td>
<td>Polymer Physics</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>KF2450</td>
<td>Fibre Technology - Natural and Synthetic Fibres</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>KF2460</td>
<td>Bio Fibre Chemistry</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
</tbody>
</table>

Conditionally elective courses

<table>
<thead>
<tr>
<th>Course code</th>
<th>Course name</th>
<th>Credits</th>
<th>Edu. level</th>
</tr>
</thead>
<tbody>
<tr>
<td>KD2150</td>
<td>Inorganic Materials Chemistry</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>KF2130</td>
<td>Polymer Chemistry</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>KF2140</td>
<td>Polymer Physics</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>KF2450</td>
<td>Fibre Technology - Natural and Synthetic Fibres</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>KF2460</td>
<td>Bio Fibre Chemistry</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
</tbody>
</table>

Recommended courses

<table>
<thead>
<tr>
<th>Course code</th>
<th>Course name</th>
<th>Credits</th>
<th>Edu. level</th>
</tr>
</thead>
<tbody>
<tr>
<td>BB2020</td>
<td>Molecular Enzymology</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
</tbody>
</table>
BB2420  Glycobiology and Carbohydrate Technology  7.5 hp  Second cycle
BB2460  Biocatalysis  7.5 hp  Second cycle
KD2310  Advanced Organic Chemistry  7.5 hp  Second cycle
KD2320  Spectroscopic Tools for Chemistry  9.0 hp  Second cycle
KD2350  Surfaces, Colloids and Soft Matter  7.5 hp  Second cycle
KE2310  Sustainable Systems for Heat, Power and Materials Production  7.5 hp  Second cycle
KF2180  Biopolymers  7.5 hp  Second cycle
KF2190  Polymeric Materials: Structure and Properties  7.5 hp  Second cycle
KF2480  Chemistry of a Biorefinery  7.5 hp  Second cycle
KF2490  Biocomposite Materials  7.5 hp  Second cycle
ME2814  Ideation- Creating Your Own Company  7.5 hp  Second cycle

Supplementary information

Study year 1 consists of two mandatory courses, at least three of the conditionally elective courses and recommended courses. **Recomended courses may be cancelled if number of admitted students are less than minimum of places, or will be given every second year.**

The courses KF2110 and AK2036 are mandatory courses for all students admitted to the program, except students admitted to program with a background at the Degree Programme in Materials Design and Engineering (CMATD), which instead must follow the courses: KD1230 and AK2036.

**CBIOT-students** who wants to obtain the Degree of Master of Science in Engineering, Degree Programme in Biotechnology, must take2 of these courses;
BB2460 Biocatalysis, 7.5 credits
BB2020 Molecular Enzymology7.5 credits
BB2420 Glycobiology and Carbohydrate Technology, 7.5 credits

**NORDIC MASTER in Polymertechnology**
Study year 1 consists of four mandatory courses and four recommended courses. See below specialisations, track Polymer Technology.

**Year 2**

**Recommended courses**

<table>
<thead>
<tr>
<th>Course code</th>
<th>Course name</th>
<th>Credits Edu. level</th>
</tr>
</thead>
<tbody>
<tr>
<td>KD2170</td>
<td>Nano-structured Materials</td>
<td>7.5 hp  Second cycle</td>
</tr>
<tr>
<td>KD2300</td>
<td>Biomedical Materials</td>
<td>7.5 hp  Second cycle</td>
</tr>
<tr>
<td>KD2380</td>
<td>Corrosion and Surface Protection</td>
<td>7.5 hp  Second cycle</td>
</tr>
<tr>
<td>KE2350</td>
<td>Risk Analysis and Management for Chemical Engineers</td>
<td>6.0 hp  Second cycle</td>
</tr>
<tr>
<td>KF2150</td>
<td>Surface Coatings Chemistry</td>
<td>7.5 hp  Second cycle</td>
</tr>
<tr>
<td>KF2470</td>
<td>Pulp and Paper Processes</td>
<td>7.5 hp  Second cycle</td>
</tr>
<tr>
<td>KF2500</td>
<td>Polymer Engineering</td>
<td>9.0 hp  Second cycle</td>
</tr>
</tbody>
</table>
Supplementary information

This is a preliminary list of courses for study year 2 for those who started the program 2014. There might be changes. Recommended courses may be cancelled if number of admitted students are less than minimum of places, or will be given every second year.

Study year 2 consists of recommended courses and a mandatory degree project, second level, 30 higher education credits.
See the list below;
Degree Project in Chemistry, Second Cycle - KD200X
Degree Project in Chemical Engineering, Second Cycle - KE200X
Degree Project in Fibre and Polymer Technology, Second Cycle - KF200X

CBIOT-students who wants to obtain the Degree of Master of Science in Engineering, Degree Programme in Biotechnology, must study 2 of these courses;
BB2460 Biocatalysis, 7.5 credits
BB2020 Molecular Enzymology 7.5 credits
BB2420 Glycobiology and Carbohydrate Technology, 7.5 credits

NORDIC MASTER in Polymertechnology
Study year 2 at KTH (year 1 studied at Aalto, DTU or NTNU) consists of 2 mandatory courses, 4 recommended courses and a mandatory degree project. See below specialisations, track Polymer Technology.

Track, Polymer Technology (POTE)

Year 1

Mandatory courses (30.0 Credits)

<table>
<thead>
<tr>
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<td>7.5 hp  Second cycle</td>
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<td>KF2110</td>
<td>Mechanical Properties of Materials</td>
<td>7.5 hp  Second cycle</td>
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<tr>
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<td>Polymer Chemistry</td>
<td>7.5 hp  Second cycle</td>
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<tr>
<td>KF2140</td>
<td>Polymer Physics</td>
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</table>

Recommended courses

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<thead>
<tr>
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<th>Credits Edu. level</th>
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</thead>
<tbody>
<tr>
<td>KF2180</td>
<td>Biopolymers</td>
<td>7.5 hp  Second cycle</td>
</tr>
<tr>
<td>KF2190</td>
<td>Polymeric Materials: Structure and Properties</td>
<td>7.5 hp  Second cycle</td>
</tr>
<tr>
<td>KF2450</td>
<td>Fibre Technology - Natural and Synthetic Fibres</td>
<td>7.5 hp  Second cycle</td>
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</table>
KF2460  Bio Fibre Chemistry  7.5 hp  Second cycle
KF2480  Chemistry of a Biorefinery  7.5 hp  Second cycle
KF2490  Biocomposite Materials  7.5 hp  Second cycle
ME2814  Ideation- Creating Your Own Company  7.5 hp  Second cycle

Supplementary information

Nordic Master in Polymertecnoology

- Study year 1 consists of four mandatory courses
- and 4 recommended courses

Year 2

Mandatory courses (45.0 Credits)

<table>
<thead>
<tr>
<th>Course code</th>
<th>Course name</th>
<th>Credits</th>
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<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>
<tr>
<td>KF200X</td>
<td>Degree Project in Fibre and Polymer Technology, Second Cycle</td>
<td>30.0 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>KF2110</td>
<td>Mechanical Properties of Materials</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
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Recommended courses

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</thead>
<tbody>
<tr>
<td>KD2300</td>
<td>Biomedical Materials</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>KF2150</td>
<td>Surface Coatings Chemistry</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>KF2470</td>
<td>Pulp and Paper Processes</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>KF2500</td>
<td>Polymer Engineering</td>
<td>9.0 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>KF2510</td>
<td>Advanced Pulp and Paper Processes</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>KF2520</td>
<td>Design of Products in Materials Chemistry</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
</tbody>
</table>

Supplementary information

Nordic Master in Polymertecnoology

Study year 2 at KTH (year 1 studied at Aalto, DTU or NTNU) consists of

- 2 mandatory courses
- 2 recommended courses
- and a mandatory degree project, second level, 30 higher education credits, Degree Project in Fibre and Polymer Technology, Second Cycle - KF200X
Appendix 2: Specialisations

Master's Programme, Macromolecular Materials, 120 credits (TMMMM), Programme syllabus for studies starting in autumn 2014

Track, Polymer Technology (POTE)

The programme provides a solid base in the chemistry and physics of organic materials, as well as their connection to real-life applications. A broad range of courses and specialisations allows students to customise their own degree profile enabling the focus on individual areas of interest. Students will learn of design, synthesis, characterisation, production and development of polymeric materials throughout the duration of the degree programme. The material group includes plastics, rubber, composites, paper, wood and other biological materials; students will be able to handle questions pertaining to the choice of raw materials (renewable versus fossil), and the choice of production processes, material combinations and manufacturing methods to achieve the desired characteristics in the finished product. Great emphasis is placed on environmental issues, such as environmentally-friendly material production and development of sustainable materials.

The language of instruction is English. Upon graduation, students will be awarded a degree from each of the two universities they attended, thus receiving a double degree.

The student should apply directly to the desired first year university and inform in the motivation letter, in which university he/she will study the second year; Aalto University, Technical University of Danmark or Norwegian University of Science and Technology. Information concerning the applications and about the academic year at the different partner universities is available from their local websites.

For more information, see www.n5poltech.org