Programme syllabus

Master’s Programme, Macromolecular Materials, 120 credits
Masterprogram, makromolekylära material
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

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.

Ability 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 consists of courses given by KTH, mainly by the School of Chemical Science and Engineering.

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.

Documentation – for detailed information about list of required documents, see “Admission requirements and selection” http://www.kth.se/en/studies/programmes/master/admission?l=en_UK

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 corresponding to at least 75 credits.
- Basic knowledge in mathematics corresponding to at least 20 credits.
- Basic knowledge in numerical analysis/computer science corresponding to at least 9 credits.


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, relevant work experience, list of qualifications for specific requirements and English proficiency.

Complete information on the eligibility requirements can be found in the local admission policy of KTH, see: http://www.kth.se/en/studies/programmes/master/admission

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 followed by a degree project, advanced level of 30 credits. Two mandatory courses (15 credits) are included in the first year, and remaining courses may be chosen from a list of 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.

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.
Degree project, advanced level for the Degree of Master of Science, Macromolecular Materials, can be performed in the following exam topics:

*Fibre and Polymer Technology, Chemistry, Chemical engineering.*

Other degree projects in related fields may also be allowed, but need approval by the Director of Undergraduate and Masters’ studies at the School of Chemical Science and Engineering. For more information, contact the study advisor at the CHE students office.

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).

**Degree name**

*Master of Science (120 credits)*

*Teknologje 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 2013

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</td>
<td>Second cycle</td>
</tr>
<tr>
<td>KD1230</td>
<td>Organic Chemistry, Basic Concepts and Practice</td>
<td>6.0</td>
<td>First cycle</td>
</tr>
<tr>
<td>KD1230</td>
<td>For students with a background at the Degree Programme Materials Design (CMATD)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>KF2110</td>
<td>Mechanical Properties of Materials</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>KF2110</td>
<td>Except students admitted to the program with a background at the Degree Programme in Materials Design and Engineering (CMATD)</td>
<td></td>
<td></td>
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</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</td>
<td>Second cycle</td>
</tr>
<tr>
<td>KF2130</td>
<td>Polymer Chemistry</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>KF2140</td>
<td>Polymer Physics</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>KF2450</td>
<td>Fibre Technology - Natural and Synthetic Fibres</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>KF2460</td>
<td>Bio Fibre Chemistry</td>
<td>7.5</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</td>
<td>Second cycle</td>
</tr>
<tr>
<td>BB2420</td>
<td>Glycobiology and Carbohydrate Technology</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>BB2460</td>
<td>Biocatalysis</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>Course code</td>
<td>Course name</td>
<td>Credits</td>
<td>Edu. level</td>
</tr>
<tr>
<td>-------------</td>
<td>----------------------------------------------------------</td>
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</tr>
<tr>
<td>KD2310</td>
<td>Advanced Organic Chemistry</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>KD2320</td>
<td>Spectroscopic Tools for Chemistry</td>
<td>9.0</td>
<td>Second cycle</td>
</tr>
<tr>
<td>KD2350</td>
<td>Surfaces, Colloids and Soft Matter</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>KE2310</td>
<td>Sustainable Systems for Heat, Power and Materials Production</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>KF2180</td>
<td>Biopolymers</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>KF2190</td>
<td>Polymeric Materials: Structure and Properties</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>KF2480</td>
<td>Chemistry of a Biorefinery</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>KF2490</td>
<td>Biocomposite Materials</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>ME2814</td>
<td>Ideation- Creating Your Own Company</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
</tbody>
</table>

**Supplementary information**

Study year 1 consists of two mandatory courses, at least three of the conditionally elective courses and recommended courses.

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.

Students in the Degree Progr. in Biotechnology, who wants to obtain the Degree of Master of Science in Engineering, Degree Programme in Biotechnology, must take 2 of these courses;

BB2460 Biocatalysis, 7,5 credits  
BB2020 Molecular Enzymology, 7.5 credits  
BB2420 Glycobiology and Carbohydrate Technology, 7.5 credits

**Year 2**

**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>KD2170</td>
<td>Nano-structured Materials</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>KD2300</td>
<td>Biomedical Materials</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>KD2380</td>
<td>Corrosion and Surface Protection</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>KE2350</td>
<td>Risk Analysis and Management for Chemical Engineers</td>
<td>6.0</td>
<td>Second cycle</td>
</tr>
<tr>
<td>KF2150</td>
<td>Surface Coatings Chemistry</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>KF2470</td>
<td>Pulp and Paper Processes</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>KF2500</td>
<td>Polymer Engineering</td>
<td>9.0</td>
<td>Second cycle</td>
</tr>
<tr>
<td>KF2520</td>
<td>Design of Products in Materials Chemistry</td>
<td>7.5</td>
<td>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 2013. There might be changes. For a correct updated list, see the study handbook for the respective study year.

Study year 2 consists of recommended courses and a mandatory degree project, second level, 30 higher education credits.

See listed degree projects:

Degree Project in Wood Chemistry KF201X
Degree Project in Paper Technology KF202X
Degree Project in Fiber Technology KF203X
Degree Project in Pulp Technology KF204X
Degree Project in Polymer Technology KF205X
Degree Project in Polymeric Materials KF206X
Degree Project in Surface Coating Tec. KF207X
Degree Project in Chemical Engin. KE202X
Degree Project in Energy Processes KE203X
Degree Project in Analytical Chemistry KD202X
Degree Project in Physical Chemistry KD203X
Degree Project in Nuclear Chemistry KD204X
Degree Project in Inorganic Chemistry KD205X
Degree Project in Organic Chemistry KD206X
Degree Project in Surface Chemistry KD207X
Degree Project in Corrosion Science KD210X

Students in the Degree Progr. in Biotechnology, who wants to obtain the Degree of Master of Science in Engineering, Degree Programme in Biotechnology, must take 2 of these courses;
BB2460 Biocatalysis, 7.5 credits
BB2020 Molecular Enzymology 7.5 credits
BB2420 Glycobiology and Carbohydrate Technology, 7.5 credits
Appendix 2: Specialisations

Master's Programme, Macromolecular Materials, 120 credits (TMMMM), Programme syllabus for studies starting in autumn 2013

This programme has no specialisations.