Programme syllabus

Master's Programme, Chemical Science and Engineering, 120 credits
Masterprogram, kemi och kemiteknik
120.0 credits

Valid for students admitted to the education from autumn 08 (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 Chemical Sciences and Engineering with specialization in Functional Materials and Surfaces, the students should:

- demonstrate basic knowledge of natural and synthetic materials and composites
- understand the relationship between the properties of materials and their chemical and physical structure

Skills and abilities

To receive a Degree of Master of Science in Chemical Sciences and Engineering with specialization in Functional Materials and Surfaces, the students should:

- demonstrate proficiency to participate in the development and production of materials
- demonstrate the ability to select appropriate materials with respect to advanced products such as information carriers, hygiene-, packaging- and biomedical materials, and specially designed materials for industrial use
- demonstrate laboratory skills on material development
- demonstrate skills in the use of computer tools for simulations, technical calculations and information retrieval
- demonstrate the ability to orally and in writing, present and discuss ideas and outcomes and communicate with persons with or without the technical and scientific background
- demonstrate ability to effectively work as a team and plan and implement projects within a given framework

Ability to make judgements and adopt a standpoint

To receive a Degree of Master of Science in Chemical Sciences and Engineering with specialization in Functional Materials and Surfaces, the students should:

- demonstrate the ability to critically review the literature and technologies in areas related to materials and surfaces, demonstrate the ability to take a stand on issues of ethical nature in their professional field
- demonstrate the ability to assess and balance the weight of the production, conversion, economy and the environmental effect of different materials in the choice of material for a certain end-product

Extent and content of the programme

Nominal study period is 2 years, which corresponds to 120 credits at advanced level.
The programme is given in English.
Eligibility and selection

In order to be admitted to the programme, a Bachelor’s degree including courses in Chemical Science and Chemical Engineering of at least 90 credits (of which at least 20 credits are chemical engineering) is required. Basic skills in mathematics and numerical methods are required and a good knowledge of English, equivalent to Eng B.

Implementation of the education

Structure of the education

The school year is normally divided into 4 study periods and two or three courses are taken simultaneously at each period. Teaching and examination methods vary between courses. Normally, a proportion of the course is lectures, which gives an introduction with the concepts and theories. Exercises, seminars and laboratory work enhance the understanding of the theoretical relationship. Projects, based on the industrial model, have an essential role in the education. These projects are designed to improve group skills when working with real-life assignments from an engineering point of view.

The programme is multi-discipliner, containing courses in chemistry, chemical engineering and fiber- and polymer technology. In order to create a continuity of the program collaboration between courses is emphasized. Courses corresponding 67.5 credits are mandatory courses for specialization in Functional materials and surfaces. The majority of these courses are scheduled for the first year, but also during the first study period at the second year. 22.5 credits are recommended courses. The programme is completed by doing a Master’s thesis equivalent to 30 credits.

Courses corresponding 51 credits are mandatory courses for specialization in Chemical Engineering for Energy. The majority of these courses are scheduled for the first year, but also during the first and second study periods at the second year. 22.5-24 credits are conditionally elective courses and 15-16.5 credits are recommended courses. The programme is completed by doing a Master’s thesis equivalent to 30 credits.

Courses

The programme is course-based. Lists of courses are included in appendix 1.

The course list can be found 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.

A seven scaled grading system from A-F is used for courses at basic and advanced level at KTH. A-E are passing grades, where A is the highest grade. The grades pass (P) and fail (F) are used for courses under certain circumstances. The grade Fx implies an opportunity to complement a failed grade to the passing grade E.

Conditions for participation in the programme

Semester registration/study notification must be done before each semester. This is made on the Web and recorded by Student Office at the School of Chemical Sciences. Anyone who intends to take a break in the studies must apply for that in advance. Mandatory course registration is done at the course start for each course.

Conditions for advancement

Some courses have special prerequisites or conditions for participation in the exam. This will be assigned in the syllabus.
**Prerequisites for studies in the second year:**

Students who have not passed 45 credits in the first year, after the re-exam period in August, must contact the educational coordinator for an individual study plan. This study plan will include residual courses or part of courses and appropriate courses for the upcoming year. The student, who has not passed the mentioned credit limit and has not contacted the educational coordinator for an individual study plan, will not be registered on any courses in the upcoming academic year. The student may not be allowed to examine any courses from the higher academic years.

**Course Registration**

Each student should register for the course on the first scheduled lecture. Students, who have been registered on a course and then decide not to pursue the course, must notify that immediately to the teacher who is responsible for the course.

It is each student's responsibility to ensure that prerequisites from previous courses are reached before starting a new course. Information about prerequisites is assigned in the respective syllabus.

**Place limitation**

If the number of students who choose a particular course exceeds the number of places on the course, the students who have the course as a mandatory course in the programme, have priority over other applicants.

**Study break**

To take a break in the studies means that the student does not participate in lectures for at least one semester.

Approved study break gives the student the right to return to the studies at the stated date. During this break, the student may do supplementary examinations and participate in examinations in previously started courses.

The application concerning a study break must be handed in to the student office. When the student intends to resume the studies, a semester registration is required, see Conditions for participation in the programme. After the study break, if the student has not applied for the semester registration or prolonged study break, it will be recorded as a withdrawal from the programme.

**Recognition of previous academic studies**

The student has the right to transfer course credits from the college / university within or outside the country. The precondition is that the course / courses are of such a nature and has such an extent that they basically correspond to the qualification criteria for the programme.

In the case of whole courses, it must be checked by the programme director. Part of a course is checked by the examiner.

**Degree project**

The program includes a Master’s thesis of 30 credits. That means about 20 weeks of full-time studies. The thesis can be in the area of chemistry, chemical engineering, or fiber and polymer technology, and it must be related to the focus area of the programme. The thesis project should provide the students an insight into a research and development projects. It may also be of investigative nature. The thesis is graded according to the scale A-F, based on the KTH-common assessment and criteria. In the thesis project, students demonstrate the ability to independently apply the knowledge they have acquired during the studies. The student may start with the thesis when 60 credits are achieved. Exemption can be granted after a checkup by the programme manager. It is the responsibility of the examiner to ensure that students have the in-depth studies is the focus area, as regarded above. The project may be carried out either in an academic environment or in an industrial setting. It can also be carried out abroad. Examiner for the thesis must always be a teacher, who is employed at the Royal Institute of Technology. Supervisors are appointed by the examiner. Several supervisors can be appointed. If the thesis is performed in a company, a supervisor should also be appointed at the company.

Before the thesis is started, it must be approved by the examiner and recorded by the School of Chemical Science, when an application is handed in.
The thesis project will consist of literature search, experimental and/or theoretical work. It will be presented both in a written statement in English, and orally at a seminar. It is the responsibility of the examiner to ensure that the thesis is performed and presented as above.

The thesis project may, after authorization from the programme manager and agreement of the School office and supervisor/examiner, also be performed in other focus areas than the focus areas mentioned above.

**Degree**

To receive a Degree of Master of Science in Chemical Sciences and Engineering passing grades in all courses that are included in the student's study plan, are required. The study plan consists of the mandatory courses, the recommended and/or conditionally elective courses that the students have followed and the thesis. The study plan should include at least 120 credits.

For receiving a degree certificate, the student need to apply for it on an application form and provide a copy of a student union card, copy of receipts or a certificate from the student union for paid union fee.

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

Master's Programme, Chemical Science and Engineering, 120 credits (TCSEM), Programme syllabus for studies starting in autumn 2008

**General courses**

**Year 1**

**Mandatory courses (30.0 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>KF2330</td>
<td>Concepts of Materials</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>KF2340</td>
<td>Chemical Sciences</td>
<td>15.0</td>
<td>Second cycle</td>
</tr>
</tbody>
</table>

**Supplementary information**

To see courses within your specialisation, choose above.

**Year 2**

**Supplementary information**

Theses work 30 hp

**Chemical Engineering för Energy (CEE)**

**Year 1**

**Mandatory courses (7.5 credits)**

<table>
<thead>
<tr>
<th>Course code</th>
<th>Course name</th>
<th>Credits</th>
<th>Edu. level</th>
</tr>
</thead>
<tbody>
<tr>
<td>KE2140</td>
<td>Energy Systems Analysis</td>
<td>7.5</td>
<td>Second cycle</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>KE2020</td>
<td>Chemical Engineering</td>
<td>9.0</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>
<td>---------</td>
<td>----------------</td>
</tr>
<tr>
<td>KE2070</td>
<td>Transport Phenomena, Advanced Course</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>KE2110</td>
<td>Applied Electrochemistry</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>MJ2620</td>
<td>Environmental Technology, Advanced Course</td>
<td>6.0</td>
<td>Second cycle</td>
</tr>
</tbody>
</table>

**Supplementary information**

Choose 2 of the following optional specialisation courses: KE2020, KE2070, KE2110 and KE2040 (year 2).

Choose 1 of the following optional specialisation courses: MJ2620 and MJ2691 (year 2).

**Year 2**

**Mandatory courses (13.5 credits)**

<table>
<thead>
<tr>
<th>Course code</th>
<th>Course name</th>
<th>Credits</th>
<th>Edu. level</th>
</tr>
</thead>
<tbody>
<tr>
<td>KE2010</td>
<td>Industrial Energy Processes</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>MJ2652</td>
<td>Environmental Effects from Technical Systems and Processes</td>
<td>6.0</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>KE2040</td>
<td>Chemical Reaction Engineering</td>
<td>9.0</td>
<td>Second cycle</td>
</tr>
<tr>
<td>MJ2691</td>
<td>Technology and Sustainable Development</td>
<td>6.0</td>
<td>Second cycle</td>
</tr>
</tbody>
</table>

**Supplementary information**

Choose 2 of the following optional specialisation courses: KE2020, KE2070, KE2110 (study year 1) and KE2040.

Choose 1 of the following optional specialisation courses: MJ2620 (study year 1) and MJ2691.

**Functional Materials and Surfaces (FMC)**

**Year 1**

**Mandatory courses (30.0 credits)**

<table>
<thead>
<tr>
<th>Course code</th>
<th>Course name</th>
<th>Credits</th>
<th>Edu. level</th>
</tr>
</thead>
<tbody>
<tr>
<td>KD2150</td>
<td>Inorganic Materials Chemistry</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>KF2380</td>
<td>Material Physics</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>KF2390</td>
<td>Functional Materials and Surfaces</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>
</tbody>
</table>
### Year 2

#### Mandatory courses (7.5 credits)

<table>
<thead>
<tr>
<th>Course code</th>
<th>Course name</th>
<th>Credits</th>
<th>Edu. level</th>
</tr>
</thead>
<tbody>
<tr>
<td>KF2400</td>
<td>Material Synthesis</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
</tbody>
</table>

#### Optional courses

<table>
<thead>
<tr>
<th>Course code</th>
<th>Course name</th>
<th>Credits</th>
<th>Edu. level</th>
</tr>
</thead>
<tbody>
<tr>
<td>KD2160</td>
<td>Structural Chemistry</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>KD2170</td>
<td>Nano-structured Materials</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>KF2070</td>
<td>Pulp and Paper Processes, Minor Course</td>
<td>6.0</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>LI106N</td>
<td>Information Searching</td>
<td>1.5</td>
<td>First cycle</td>
</tr>
<tr>
<td>SD2505</td>
<td>Biomaterials and Products</td>
<td>7.0</td>
<td>Second cycle</td>
</tr>
</tbody>
</table>

#### Supplementary information

You should study 22.5 hp optional courses.
Appendix 2: Specialisations

Master's Programme, Chemical Science and Engineering, 120 credits (TCSEM), Programme syllabus for studies starting in autumn 2008

Chemical Engineering för Energy (CEE)

Functional Materials and Surfaces (FMC)