Programme syllabus

Master's Programme, Chemical Engineering for Energy and Environment, 120 credits
Masterprogram, kemiteknik för energi och miljö
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 Master of Science degree in Chemical Engineering for Energy and the Environment the student should:

- demonstrate general knowledge and understanding in chemical engineering on an advanced level, and in-depth knowledge in a selected chemical engineering area.

- have insight into current research and development in chemical engineering, and its application to sustainable development.

- demonstrate knowledge of the scientific basis for different kinds of energy and their conversion as well as for environmental aspects, and to assess the applicability of the used models in different contexts.

- be able to apply knowledge of mathematics, numerical analysis and other sciences in the field of chemical engineering.

Skills and abilities

To receive a Master of Science degree in Chemical Engineering for Energy and the Environment the student should:

- demonstrate the ability to identify, formulate and manage current and real problems related to chemical engineering and drawn from industry, society and research, taking into account the potential, limitations and the goals of society for sustainable development.
• demonstrate the ability to make assessment of the reasonableness of the obtained solutions, and compare and evaluate alternative solutions.

• demonstrate the skills to use computer tools for simulation, technical calculations and information retrieval.

• demonstrate the ability to, orally and in writing, present and discuss ideas and outcomes.

• 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 Master of Science degree in Chemical Engineering for Energy and the Environment the student should:

• demonstrate the ability to critically review the literature and technologies related to chemical engineering,

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

• demonstrate an understanding for the fact that chemical engineering problems can be complex, incompletely defined and contain contradictory conditions.

• demonstrate the ability to rapidly acquire knowledge in new areas and to apply new knowledge for innovation and development of chemical products and chemical engineering processes.

**Extent and content of the programme**

*Chemical Engineering for Energy and the Environment* 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”

*Specific admission requirements*
In order to be admitted to the *Chemical Engineering for Energy and the Environment* programme, a
Bachelor's degree in Chemistry or closely related subject, of 180 credits, including the following is required:

- Courses in chemistry and chemical engineering or closely related subject corresponding to at least 75 credits, of which at least 22.5 credits in chemical engineering.
- Basic knowledge in mathematics corresponding to at least 20 credits.
- Basic knowledge in numerical analysis/computer science corresponding to at least 9 credits.

**Selection process**
The selection process for the Chemical Engineering for Energy and the Environment programme is 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 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 (30 credits). One mandatory course (7.5 credits) is included the first year, and one mandatory course (15 credits) during the second year. The rest of the courses are conditionally elective or elective. The student is required to choose at least 2 courses listed as conditionally elective. The remaining courses should be selected from the courses listed as conditionally elective or recommended with the exception of 15 credits that can be chosen freely outside the list. This gives the student a great opportunity to create his/her own curriculum. Guidelines and recommendations for course combinations will be given.

**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 in the end of August when the registration also takes place and where the student must be present 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 director, 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 at least 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, Chemical Engineering for Energy and Environment, can be performed in the following exam topics:
*Chemistry, Chemical engineering, Fibre and Polymer Technology.*
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 student office.

More information on the KTH policy on the degree project can be found at: http://intra.kth.se/en/regelverk/utbildning-forskning/grundutbildning/examensarbete/overgripande-regler-och-riktlinjer-for-examensarbete-30-hogskolepoang-for-masterexamen-120-hogskolepoang-samt-betygssattning-av-examensarbete-1.27212

**Degree**

Master of Science (120 credits) - is obtained after completion of the Master (120 credits) Chemical Engineering for Energy and the Environment 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 fulfill 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)*

*Teknologiet for mekanisk strukturforskning*

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, Chemical Engineering for Energy and Environment, 120 credits (TKEMM), Programme syllabus for studies starting in autumn 2014

General courses

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>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>Course code</th>
<th>Course name</th>
<th>Credits</th>
<th>Edu. level</th>
</tr>
</thead>
<tbody>
<tr>
<td>AL2181</td>
<td>Environmental System Analysis and Decision-making</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>KE2010</td>
<td>Industrial Energy Processes</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>KE2040</td>
<td>Chemical Reaction Engineering</td>
<td>9.0 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>KE2070</td>
<td>Transport Phenomena, Advanced Course</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>KE2180</td>
<td>Separation Processes for the Process Industry and the Environment</td>
<td>9.0 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>AL2140</td>
<td>Cleaner Production</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>AL2160</td>
<td>Environmental Management</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>KE2050</td>
<td>Environmental Catalysis</td>
<td>6.0 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>KE2060</td>
<td>Computational Project in Chemical Engineering</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>KE2110</td>
<td>Applied Electrochemistry</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
</tbody>
</table>
KE2130    Renewable Fuel Production Processes                7.5 hp  Second cycle
KE2300    Electrochemical Energy Devices                    7.5 hp  Second cycle
KE2310    Sustainable Systems for Heat, Power and Materials Production 7.5 hp  Second cycle
KE2350    Risk Analysis and Management for Chemical Engineers 6.0 hp  Second cycle
ME2814    Ideation- Creating Your Own Company                 7.5 hp  Second cycle

Supplementary information

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

Year 2

Mandatory courses (15.0 Credits)

<table>
<thead>
<tr>
<th>Course code</th>
<th>Course name</th>
<th>Credits Edu. level</th>
</tr>
</thead>
<tbody>
<tr>
<td>KE2325</td>
<td>Process Design for Industry and Society</td>
<td>15.0 hp  Second cycle</td>
</tr>
</tbody>
</table>

Recommended courses

<table>
<thead>
<tr>
<th>Course code</th>
<th>Course name</th>
<th>Credits Edu. level</th>
</tr>
</thead>
<tbody>
<tr>
<td>KD2380</td>
<td>Corrosion and Surface Protection</td>
<td>7.5 hp  Second cycle</td>
</tr>
<tr>
<td>KD2420</td>
<td>Environmental Aspects of Atmospheric, Aquatic and Terrestrial Chemistry</td>
<td>7.5 hp  Second cycle</td>
</tr>
<tr>
<td>KD2430</td>
<td>Nuclear Fuel Cycle</td>
<td>9.0 hp  Second cycle</td>
</tr>
<tr>
<td>KE2190</td>
<td>Experimental Process Design Year 2 only</td>
<td>6.0 hp  Second cycle</td>
</tr>
<tr>
<td>KE2330</td>
<td>The course is recommended to be read in conjunction with the course KE2190</td>
<td>9.0 hp  Second cycle</td>
</tr>
<tr>
<td>KF2470</td>
<td>Pulp and Paper Processes</td>
<td>7.5 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 one mandatory course, 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
Appendix 2: Specialisations

Master's Programme, Chemical Engineering for Energy and Environment, 120 credits (TKEMM), Programme syllabus for studies starting in autumn 2014

This programme has no specialisations.