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 15 (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 in and understanding of 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 and also communicate with persons outside the scientific field.
- 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), second cycle, master's programme. The language of instruction is English.

**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 prove 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” at www.kth.se

**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 is based on the following selection criteria: University, previous studies (for instance GPA, grades in specific subjects and English), motivation for the studies (for instance letter of motivation, references, thesis proposal and relevant work experience). The evaluation scale is 1-75.

**Implementation of the education**

**Structure of the education**

The academic year is 40 weeks and is divided into two semesters, autumn and spring. Each semester consists of two study periods.

For information on the extent of the school year, the exam and reexamination see "student” schedules at www.kth.se

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.
**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. Thereafter the student must register to the term and to the courses via the personal menu. The students are required to make a course selection for the coming term via www.universityadmissions.se not 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 regulations, policy in credit transfer www.kth.se

**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. To start the Degree project the student must at least have completed 60 credits, where at least 30 credits in the second cycle within the main field of study. The examiner of the degree project may add additional prerequisites.

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.

Information regarding the grading scale and criteria of the degree project work read the course syllabus.

More information on the KTH policy on the degree project can be found at www.kth.se

**Degree**

In order to graduate with the Degree of Master of Science (Two Years) a pass grade must be achieved in all courses, which are included in the student’s study plan. The study plan shall comprise 120 higher education credits including a degree project comprising 30 higher education credits.

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

Degree of Master of Science (120 credits)

Teknologie masterexamen

For further information see www.kth.se

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 2015

**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</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</td>
<td>Second cycle</td>
</tr>
<tr>
<td>KE2010</td>
<td>Industrial Energy Processes</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>KE2040</td>
<td>Chemical Reaction Engineering</td>
<td>9.0</td>
<td>Second cycle</td>
</tr>
<tr>
<td>KE2070</td>
<td>Transport Phenomena, Advanced Course</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>KE2180</td>
<td>Separation Processes for the Process Industry and the Environment</td>
<td>9.0</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</td>
<td>Second cycle</td>
</tr>
<tr>
<td>AL2160</td>
<td>Environmental Management</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>KD2430</td>
<td>Nuclear Fuel Cycle</td>
<td>9.0</td>
<td>Second cycle</td>
</tr>
<tr>
<td>KE2050</td>
<td>Environmental Catalysis</td>
<td>6.0</td>
<td>Second cycle</td>
</tr>
<tr>
<td>KE2060</td>
<td>Computational Project in Chemical Engineering</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>Course code</td>
<td>Course name</td>
<td>Credits</td>
<td>Edu. level</td>
</tr>
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</tr>
<tr>
<td>KE2130</td>
<td>Renewable Fuel Production Processes</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>KE2300</td>
<td>Electrochemical Energy Devices</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>KE2350</td>
<td>Risk Analysis and Management for Chemical Engineers</td>
<td>6.0</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 one mandatory course, at least two of the conditionally elective courses and recommended courses. Recommended courses may be cancelled if number of admitted students are less than minimum of places, or will be given every second year.

Students from CENMI program can only chose among the conditionally elective courses;

- KE2070 Transport Phenomena, Advanced Course
- KE2180 Separation Processes for the Process Industry and the Environment
- KE2040 Chemical Reaction Engineering

**Year 2**

**Mandatory courses (15.0 credits)**

<table>
<thead>
<tr>
<th>Course code</th>
<th>Course name</th>
<th>Credits</th>
<th>Edu. level</th>
</tr>
</thead>
<tbody>
<tr>
<td>KE2325</td>
<td>Process Design for Industry and Society</td>
<td>15.0</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>KD2380</td>
<td>Corrosion and Surface Protection</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>KD2420</td>
<td>Environmental Aspects of Atmospheric, Aquatic and Terrestrial Chemistry</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>KE2190</td>
<td>Experimental Process Design</td>
<td>6.0</td>
<td>Second cycle</td>
</tr>
<tr>
<td>KE2330</td>
<td>Sustainable Production of Pharmaceuticals</td>
<td>9.0</td>
<td>Second cycle</td>
</tr>
<tr>
<td></td>
<td><em>The course is recommended to be read in conjunction with the course KE2190</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td>KF2470</td>
<td>Pulp and Paper Processes</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 2015. 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

**Year 3**
Appendix 2: Specialisations

Master's Programme, Chemical Engineering for Energy and Environment, 120 credits (TKEMM), Programme syllabus for studies starting in autumn 2015

This programme has no specialisations.