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 20 (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 an individual and in 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 their studies in the end of August. To register, the student must be present in person at the programme start.
Participation requires admission to courses within the programme and course registration. Course registration is done via the personal menu at www.kth.se

Course selections for upcoming semesters are done no later than November 15 and May 15 each academic year.

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 degree project is the final part of the education. The project work may begin when special admission requirements for the course are fulfilled.

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)
Teknologio masterexamen

For further information 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 2020

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>Mandatory for students from the Degree Programme in Energy and Environment (CENMI)</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>KE2045</td>
<td>Chemical Reaction Engineering</td>
<td>7.5 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>KE2185</td>
<td>Separation Processes</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>AL2143</td>
<td>Cleaner Production and Industrial Environmental Technology</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>CE2010</td>
<td>Nuclear Chemistry</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>CK2010</td>
<td>Carbon dioxide neutral energy and transport system</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>Course code</td>
<td>Course name</td>
<td>Credits</td>
<td>Edu. level</td>
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</tr>
<tr>
<td>KE2051</td>
<td>Environmental Catalysis</td>
<td>7.5 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>
<tr>
<td>KE2130</td>
<td>Renewable Fuel Production Processes</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>KE2300</td>
<td>Electrochemical Energy Devices</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>KE2310</td>
<td>Sustainable Systems for Heat, Power and Materials Production</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>KE2351</td>
<td>Risk Analysis and Management for Chemical Engineers</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>KE2355</td>
<td>Resource recovery from waste</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>ME2814</td>
<td>Ideation- Creating Your Own Company</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
</tbody>
</table>

Supplementary information

It is advisable to take at least two of the conditionally elective courses during study year. 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 the Degree Programme in Energy and Environment (CENMI) have to study the course AL2181 Environmental System Analysis and Decision-making.

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 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>KD2380</td>
<td>Corrosion and Surface Protection</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>KE2195</td>
<td>Experimental Process Design</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>KE2331</td>
<td>Pharmaceutical Technology</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>
</tbody>
</table>

Supplementary information

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, more conditionally elective courses, 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 2020

This programme has no specialisations.