Programme syllabus

Degree Programme in Energy and Environment
Civilingenjörsutbildning i energi och miljö
300.0 credits

Valid for students admitted to the education from autumn 19 (HT - Autumn term; VT - Spring term).

This is a translation of the Swedish, legally binding, programme syllabus.

Programme objectives

In addition to the objectives specified in the Swedish Higher Education Ordinance, a graduate Master of Science in Engineering from Energy and Environment at KTH shall …

Knowledge and understanding

- have basic knowledge of all aspects of the energy system in a broad sense, which includes the technologies and subsystems that are found in all stages from energy source to the energy’s end use, and be able to understand these as socio-technical systems consisting of both technical components and the actors that develop, manages and use the system

- have good knowledge of the processes of modelling, simulation and validation of energy and environmental systems using modern engineering tools

- possess good knowledge of conditions relating to innovation, corporate enterprises and business in terms of the planning, strategies and objectives of businesses within the energy and environment sector

Skills and abilities

- be able to describe sustainable development and relevant environmental problems at a foundational level, i.e., visions, concepts, definitions, and be able to provide a description of the current global situation

- be able to, in a professional way, express themselves and communicate thoughts, ideas, visions and results to those in their professional proximity and the surrounding community

- be able to critically analyse the historical and future importance of the energy and environment sector for global and local societal development and its relation to ecological systems
• be able to compare and discuss different perspectives on issues of importance to sustainable development

**Ability to make judgements and adopt a standpoint**

• have a holistic view of sustainable development with systems and life-cycle thinking for products and services and for technical systems, based on an interdisciplinary approach and based on different actor perspectives

• have the ability to assess ethical issues and conflicts of objectives relating to sustainable development, and demonstrate a deep knowledge of the engineer's role and responsibilities in society, especially regarding social and economic aspects and environmental/ecological aspects

• have the skills to challenge, develop and problematise prevailing habits, thought patterns, technical and economic systems, and cultural and societal values.

**Extent and content of the programme**

The Degree Programme in Energy and Environment comprises 300 higher education credits, which corresponds to 5 years of full-time studies at a normal study pace (10 semesters).

The programme's first three years (180 credits) are primarily first cycle.

During the two final years (120 credits), the student undertakes a Master's programme. Master's programme courses are conducted primarily in the second cycle.

The academic year 2019/2020 offers the following Master's programmes that lead to a Degree of Master of Science in Energy and Environment

- **Environmental Engineering and Sustainable Infrastructure**
- **Sustainable Urban Planning and Design**
- **Chemical Engineering for Energy and Environment**
- **Electric Power Engineering**
- **Sustainable Energy Engineering**
- **Technology and Sustainable Development**

You may also obtain a masters degree in engineering in Energy and Environment by completing the following international masters degree programmes. You apply to these programmes in competition with other students, there is hence no guarantee that you will be admitted to these programmes.

**Environomical Pathways for Sustainable Energy Systems**
Energy Innovation
Track:
Renewable Energy
Smart Electrical Networks and System
Smart Cities

The range of offered Master's programmes may be revised. An updated list of elective Master's programmes can be found on the KTH student web for each respective academic year.

Language of instruction
The language of instruction for the first three years of first cycle is mainly Swedish, but the language of instruction in the second cycle for the final two years is mostly English.

Eligibility and selection
Admission to the Degree Programme in Energy and Environment requires the general entry requirements for higher education, and also special admission requirements as follows:

Upper-secondary education before 1 July 2011 and upper-secondary adult education before 1 July 2012

Field-specific entry requirement 9
Specific admission requirements corresponding to:
Mathematics E, Physics B and Chemistry A.
In each of the subjects, a minimum grade of Pass or 3 is required.

Upper-secondary education from 1 July 2011 and upper-secondary adult education from 1 July 2012 (Gy11/Vux12)

Field-specific entry requirement A9
Specific admission requirements corresponding to:
Mathematics 4, Physics 2 and Chemistry 1.
A grade of E is required as a minimum in each of the subjects.

For more information on field-specific entry requirements, see www.hsv.se

For entry requirements and selection principles, see the KTH admission regulations, www.kth.se

Implementation of the education

Structure of the education
Academic year

Each academic year consists of two semesters which are 20 weeks each, and each semester is further divided into two study periods.

Year 1 - 3

The programme consists of a compulsory foundation block in the years 1-3 in the first cycle (G), and also of a Master's programme in the second cycle (A) during years 4 and 5, which concludes with a degree project of 30 credits.

The programme is organised around courses in applied subjects relating to mathematics, engineering science and technology but also provides a social sciences foundation for energy and environmental issues, as well as sustainable development in a broader perspective. The teaching and use of professional skills and abilities of great importance to a certified engineer, for example, communication, ethics, entrepreneurship and innovation, corporate and societal aspects, are integrated into the courses.

To create a unified whole, the programme emphasises collaboration between different subjects, both within a specific year and between years. Integration of the courses in year 1 occurs through the profile course “Energy, climate and environment”, which runs throughout the academic year and in collaboration with the parallel courses. In year 2, the majority of courses collaborate through a focus on a systems perspective and modelling, while the Bachelor's degree project and focus on communication are integrated between the compulsory courses in year 3. The Bachelor's degree project centres around and deepens the theoretical knowledge and practical skills within sustainable development and its integration within their chosen technical field.

The courses in years 1 and 2 and parts of the courses in year 3 are common for all students on the programme. Year 3 is organised into different profiles within which there is room for elective courses and courses that qualify the student for subsequent Master's programmes. Prior to the concluding stage of the education, the student chooses a Master's programme.

The first three years conclude with a degree project for a Degree of Bachelor worth 15 credits within a chosen technical field. After successfully completing 180 credits within the programme, the student can apply for a technical Degree of Bachelor. If the qualification requirements are met, a Degree of Bachelor of Science is obtained.

Year 4 – Year 5, second-cycle studies

The Master's programmes consist mainly of second-cycle courses and a degree project within one and the same engineering science discipline. Students on the programme can choose from a wide range of Master's programmes with programme syllabuses established in advance. There is no restriction on the number of places on the Master's programmes for students on the Degree Programme in Energy and Environment. Each student may undertake the programme chosen.

Elective Master's programmes that lead to a Degree of Master of Science in Engineering are found under the heading “Scope and content of the programme”.

The range of offered Master's programmes may be revised. An updated list of Master's programmes can be found on the KTH student web for each respective academic year.
Courses

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

The programme consists of compulsory, conditionally elective, recommended and optional courses. The compulsory courses are defined for each year in course lists. The goals, entry requirements, contents and course requirements for each course can be found in the adopted course syllabuses.

The forms of teaching and examination vary between courses. These are indicated in each official course syllabus.

The optional courses can be chosen from KTH's range of offered courses. Courses at other universities/higher education institutions can also be credited to the student as optional courses.

The following limitations apply to optional courses:

- Optional courses may not be taken in year 1.
- There is a limit imposed on the number of credits that may be chosen per semester
- An optional course may not correspond to a significant extent to an existing programme course or an already credited course
- Higher education preparatory courses may not be counted as optional courses
- Optional courses may be chosen but should be relevant to the professional role of engineer.

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.

Grading scale is found in the course syllabus

Conditions for participation in the programme

Participation requires admission to courses within the programme and course registration.

For studies at a higher study year there are specific admission requirements for the courses. Admission requirements are specified in the course syllabus.

Choice of technical specialisation

Prior to the autumn semester of year 3, semester 5, the year-2 student selects an engineering profile.

The student can choose one of the following engineering profiles:

- Environmental Engineering and Sustainable Infrastructure
- Sustainable Urban Planning and Design
- Chemical Engineering for Energy and Environment
• Electric Power Engineering
• Sustainable Energy Engineering
• Technology and Sustainable Development

The range of engineering profiles may be revised. An updated list of engineering profiles can be found on the KTH student web for each respective academic year.

Applying for Degree Programme.

Prior to year 4/Master's year 1, second cycle, the student chooses a Master's programme within the framework of their Degree Programme.

Choice of Master's programme is made by the students within the Degree Programme according to KTH instructions.

According to the KTH Admission regulations 2019-01-01 (Dnr. V-2018-0961)

"In order to be eligible for advanced level studies within the integrated Master of Science programmes at KTH, you are required to complete 165 credits from year one through three. Of these, 110 credits must be from the year 1 and 2 curriculum. Degree project first cycle of 15 credits needs to be completed before Master’s level studies commence Degree Programme in Energy and Environment.

Degree project

Degree project, first cycle
Within the degree programme a degree project, first cycle, which comprises 15 credits, is included. The degree project course can be commenced when the special admission requirements listed in the course syllabus are fulfilled.

Degree project, second cycle
Within the degree programme a degree project, second cycle, which comprises 30 credits, is included. The degree project course forms the final part of the degree programme in mechanical engineering. The degree project course can be commenced when the special admission requirements listed in the course syllabus are fulfilled.

Degree

In order to complete a Degree in Master of Science in Engineering, Degree Program Energy and Environment, requires an approved grade in all courses included in the students study plan based on the degree programme. The study plan shall comprise 300 credits, which includes a degree project, first cycle comprising 15 credits and a degree project, second cycle comprising 30 credits

Optional introductory courses and preparatory courses cannot be included as part of the degree.
Courses whose content is similar to one or more other courses within the programme cannot be counted as part of the 300 credits that form the basis for the degree.

Title of general qualification at first cycle
Bachelor of Science (180 credits)

Title of professional qualifications at second cycle
Degree of Master of Science in Engineering

Title of general qualification at second cycle
Degree of Master of Science (120 credits)

Appendix 1 - Course list
Appendix 2 - Programme syllabus descriptions
### General courses

#### Year 1

**Mandatory courses (60.0 Credits)**

<table>
<thead>
<tr>
<th>Course code</th>
<th>Course name</th>
<th>Credits</th>
<th>Edu. level</th>
</tr>
</thead>
<tbody>
<tr>
<td>AG1808</td>
<td>Energy, Climate and The Environment</td>
<td>9.0 hp</td>
<td>First cycle</td>
</tr>
<tr>
<td>KA1020</td>
<td>Fundamental Chemistry</td>
<td>7.5 hp</td>
<td>First cycle</td>
</tr>
<tr>
<td>MJ1508</td>
<td>Ecology and Environmental Effects</td>
<td>7.5 hp</td>
<td>First cycle</td>
</tr>
<tr>
<td>SF1624</td>
<td>Algebra and Geometry</td>
<td>7.5 hp</td>
<td>First cycle</td>
</tr>
<tr>
<td>SF1625</td>
<td>Calculus in One Variable</td>
<td>7.5 hp</td>
<td>First cycle</td>
</tr>
<tr>
<td>SF1626</td>
<td>Calculus in Several Variable</td>
<td>7.5 hp</td>
<td>First cycle</td>
</tr>
<tr>
<td>SG1102</td>
<td>Mechanics, Smaller Course</td>
<td>6.0 hp</td>
<td>First cycle</td>
</tr>
<tr>
<td>SK1110</td>
<td>Electromagnetism and Waves</td>
<td>7.5 hp</td>
<td>First cycle</td>
</tr>
</tbody>
</table>

#### Year 2

**Mandatory courses (60.0 Credits)**

<table>
<thead>
<tr>
<th>Course code</th>
<th>Course name</th>
<th>Credits</th>
<th>Edu. level</th>
</tr>
</thead>
<tbody>
<tr>
<td>AE1502</td>
<td>Environmental Systems Analysis for Energy and Environment</td>
<td>7.5 hp</td>
<td>First cycle</td>
</tr>
<tr>
<td>EI1120</td>
<td>Electrical Circuit Analysis for the Environment and Energy Program</td>
<td>7.5 hp</td>
<td>First cycle</td>
</tr>
<tr>
<td>KE1060</td>
<td>Material and Energy Balances</td>
<td>7.5 hp</td>
<td>First cycle</td>
</tr>
<tr>
<td>MJ1112</td>
<td>Applied Thermodynamics</td>
<td>9.0 hp</td>
<td>First cycle</td>
</tr>
<tr>
<td>MJ1145</td>
<td>Energy Systems</td>
<td>7.5 hp</td>
<td>First cycle</td>
</tr>
<tr>
<td>SF1519</td>
<td>Numerical Methods and Basic Programming</td>
<td>9.0 hp</td>
<td>First cycle</td>
</tr>
<tr>
<td>SF1633</td>
<td>Differential Equations I</td>
<td>6.0 hp</td>
<td>First cycle</td>
</tr>
</tbody>
</table>
SF1917 Probability Theory and Statistics 6.0 hp First cycle

Year 3

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>AG1812</td>
<td>Environmental Economics</td>
<td>7.5 hp</td>
<td>First cycle</td>
</tr>
<tr>
<td>AK2207</td>
<td>Energy Systems in Society</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>AL125X</td>
<td>Degree Project in Energy and Environment, First Cycle</td>
<td>15.0 hp</td>
<td>First cycle</td>
</tr>
</tbody>
</table>

Supplementary information

Course list: Information is based upon the curriculum for academic year 2019/2020. Course list 2020/2021 is decided on November 1 2019

Changes may occur.


Chemical Engineering for Energy and the Environment
Electric Power Engineering
Environmental Engineering and Sustainable Infrastructure
Sustainable Energy Engineering
Sustainable Technology
Sustainable Urban Planning and Design
Sustainable Production Development
Appendix 2: Specialisations

Degree Programme in Energy and Environment (CENMI), Programme syllabus for studies starting in autumn 2019

This programme has no specialisations.