Programme syllabus

Master's Programme, Sustainable Energy Engineering, 120 credits
Masterprogram, hållbar energiteknik
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

Beyond the goals which are specified by the Higher Degree ordinance, there are also specific goals for this programme.

A graduate from the programme must:

Knowledge and understanding

• Have a broad technical scientific foundation in order to work within the areas of energy technology. This should include knowledge about today’s and the future’s systems which are applicable to environmental affects, energy sources and related to industry and renewable energy processes
• Show a broad knowledge within these technical areas, including knowledge in mathematics and natural sciences as well as essential in depth knowledges within certain parts of this area

Skills and abilities

• Show a good ability to utilise theories, both individually and in groups, in practical situations with regards to technical and natural scientific aspects and with regards taken to relevant scientific, professional and social judgements and approaches
• Show a good ability to analyse, formulate and handle technical problems from a system perspective, with an overview of their life-cycle, from idea/need to specification, development, maintenance, and termination and the ability to delimit, decide resources, needed and lead processes for problem solving and realisation
• Possess individual and professional abilities such as language, leadership, project management and communication for work as an engineer in a leading position or as a leader in a technology-intensive company, or in order to be able to continue towards a research career

Ability to make judgements and adopt a standpoint
• have especially good understanding that engineering-problems are often complex, can be incompletely defined and sometimes contain contradictions
• Be aware about the responsibility and the ethical standpoints which can occur in relation to different technical, organisational, economical, ecological and social organisations

KTH’s local degree ordinance can be found in KTH’s guidelines, www.kth.se.

**Extent and content of the programme**

The programme comprises 120 higher education credits which correspond to two years of full-time study. The programme is primarily in the second cycle.

Selectable tracks within Sustainable Energy Engineering are:

- Energy Usage
- Power Production
- Solar energy, is given in collaboration with HDa

The language of instruction is entirely English.

The programme can, in its entirety, be taken entirely from a distance.

**Eligibility and selection**

In order to be eligible for the Master’s programme, a relevant higher education, Bachelor of Science in Engineering or technical bachelor, degree preferably within Mechanical Engineering or Chemical Engineering comprising 180 higher education credits is required.

Other, corresponding, degrees within natural science in the first cycle can also provide eligibility provided that the relevant courses in technical thermodynamics, fluid mechanics, or heat transfer have been fulfilled. There is a special requirement of English B or the corresponding knowledge. Other studies or work experiences are judged by competencies referred to. This knowledge can be judged as not complete if:

1. The grade point average is in the lower third of the used grading scale
2. The university/institution where the degree is completed is regarded by the local authorities as an unacceptable quality standard of education
3. The degree is not deemed sufficient for admission to a master’s programme in the country which it was received

Other studies or work experiences are judged on the basis of the competence referred to.

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

Study years, terms, and study periods are described in KTH’s guidelines, www.kth.se

Structure of the education

The programme starts with a common course package which provides a solid foundation for the four tracks: Power Production, Energy Usage, Nuclear engineering and Solar Energy - which are given primarily during term 2. The third term comprises continuation studies within the energy area with a research-preparing perspective. The programme is concluded with a degree project during term 4.

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

Term enrolment

A condition in order to participate in the studies is that the student, each spring and autumn must enrol for the coming term. This is done through “Mina sidor”, between the 1st and 15th of November and the 1st and 15th of May, respectively.

By completing term enrolment, the students have confirmed their intention to study and participate in the programme. Only after that may the student be able to:

- Register for the term
- Register for courses
- Get results reported

Course selection

The student select courses before each term according to KTH’s central guidelines

Selection of track

Choice of track is done in the form of enrolment to the respective courses before the start of term 2. There is no limitation on the number of places available in the specialisation.
Conditions for participation in the courses

For studies in study year 2:

At least 45 higher education credits must be completed from study year 1 by the end of the examination period in August. Students who have not fulfilled this requirement must, in collaboration with a study adviser, create an individual study plan. The main intent with the individual study plan is that the student will complete the remaining elements during the next coming study year. In the study plan, the remaining elements should be included as well as suitable courses from the next study year. Special consideration should be given to the courses’ prerequisites.

Recognition of previous academic studies

Students have the possibility to apply for recognition of previous academic studies from course(s) at another higher education institution or university, both national and international.

KTH’s entire policy for recognition of previous academic studies can be found in KTH’s guidelines, www.kth.se

Studies abroad

There exists a number of possibilities to study abroad within the programme, for example between study year 1 and 2 or during the degree project. Certain exchanges can occur with the help of scholarships, for example Minor Field Studies.

Degree project

KTH’s rules for the degree project can be found in KTH’s guidelines, www.kth.se.

Generally, a large portion of the studies must be completed before the degree project can be started.

Degree

In order to earn Degree of Master of Science in Mechanical Engineering (120 credits), passing grades in all courses which are included in the student’s study plan are required. The study plan must comprise 120 higher education credits which include a degree project consisting of 30 higher education credits, in the second cycle.

KTH’s local degree ordinance can be found at KTH's website, www.kth.se.

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

Master's Programme, Sustainable Energy Engineering, 120 credits (TSUEM), Programme syllabus for studies starting in autumn 2015

General courses

Year 1

Mandatory courses (45.0 Credits)

<table>
<thead>
<tr>
<th>Course code</th>
<th>Course name</th>
<th>Credits</th>
<th>Edu. level</th>
</tr>
</thead>
<tbody>
<tr>
<td>MJ1402</td>
<td>Introduction to Energy Technology</td>
<td>3.0 hp</td>
<td>First cycle</td>
</tr>
<tr>
<td>MJ2405</td>
<td>Sustainable Power Generation</td>
<td>9.0 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>MJ2407</td>
<td>Sustainable Energy Utilisation</td>
<td>9.0 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>MJ2410</td>
<td>Energy Management</td>
<td>6.0 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>MJ2411</td>
<td>Renewable Energy Technology</td>
<td>6.0 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>MJ2413</td>
<td>Energy and Environment</td>
<td>6.0 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>MJ2429</td>
<td>Turbomachinery</td>
<td>6.0 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>ME2085</td>
<td>Transformation in Energy Systems and Industries</td>
<td>6.0 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>ME2087</td>
<td>Profile Transformation of energy systems: Policy and management</td>
<td>6.0 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>MJ2244</td>
<td>Airbreathing Propulsion, Intermediate Course I</td>
<td>6.0 hp</td>
<td>Second cycle</td>
</tr>
</tbody>
</table>
**Introduction to Energy Systems Analysis and Applications - Minor Course**
Profile Transformation of energy systems: Policy and management  
6.0 hp  Second cycle

**Renewable Energy Technology, Advanced Course**
Profile Sustainable power generation  
6.0 hp  Second cycle

**Thermal Comfort and Indoor Climate**
Profile Sustainable energy utilization  
6.0 hp  Second cycle

**Applied Refrigeration and Heat Pump Technology**
Profile Sustainable energy utilization  
6.0 hp  Second cycle

**Computational Methods in Energy Technology**
Profile Sustainable energy utilization, Sustainable power generation, Solar energy and Turbomachinery  
6.0 hp  Second cycle

**Applied Heat and Power Technology**
Profile Sustainable power generation  
6.0 hp  Second cycle

**Thermal Turbomachinery**
Profile Turbomachinery, only one of MJ2244 or MJ2430 can be chosen (for MJ2430, MJ2429 is needed)  
6.0 hp  Second cycle

**Design of Photovoltaic and Hybrid Systems**
Profile Solar energy  
5.0 hp  Second cycle

**Solar Heating Systems**
Profile Solar Energy  
6.0 hp  Second cycle

**Strategies in the Global Climate Agenda**
Profile Transformation of energy systems: Policy and management  
6.0 hp  Second cycle

**Supplementary information**

**One profile must be chosen:**

**Sustainable Energy Utilization**
(mandatory courses: MJ2424, MJ2422, MJ2423)

**Power Generation**
(mandatory courses: MJ2424, MJ2411, MJ2412, MJ2426)

**Solar Energy**
(mandatory courses: MJ2424, MJ2411, MJ2441, MJ2442)

**Turbomachinery**
(mandatory courses: MJ2424, MJ2429, MJ2430 or MJ2244)

**Transformation of Energy Systems: Policy and Management**
(mandatory courses: ME2087, ME2085, MJ2476, MJ2381)

The courses: MJ2405, MJ2407, MJ2410, MJ2413 are compulsory for civil engineering.
## Year 2

### Mandatory courses (18.0 Credits)

<table>
<thead>
<tr>
<th>Course code</th>
<th>Course name</th>
<th>Credits</th>
<th>Edu. level</th>
</tr>
</thead>
<tbody>
<tr>
<td>MJ2409</td>
<td>Applied Energy Technology, Project Course</td>
<td>9.0 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>MJ2440</td>
<td>Measurement Techniques</td>
<td>3.0 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>MJ2475</td>
<td>Theory and Methodology of Science for Energy Research</td>
<td>6.0 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>ME2086</td>
<td>Global Energy Markets and Systems in Transition</td>
<td>6.0 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>MJ2241</td>
<td>Profile Transformation of Energy Systems: Policy and Management</td>
<td>6.0 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>MJ2420</td>
<td>Combustion Theory</td>
<td>6.0 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>MJ2425</td>
<td>Cooling of Electronics</td>
<td>6.0 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>MJ2429</td>
<td>Turbomachinery</td>
<td>6.0 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>MJ2434</td>
<td>Advanced Refrigeration and Heat Pump Technology</td>
<td>6.0 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>MJ2460</td>
<td>Green Building - Concept, Design, Construction and Operation</td>
<td>6.0 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>MJ2462</td>
<td>Achieving Energy Efficiency in Existing Buildings</td>
<td>6.0 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>MJ2477</td>
<td>Profile Transformation of Energy Systems: Policy and Management</td>
<td>6.0 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>MJ2481</td>
<td>Aeromechanics Project Course - Part 1</td>
<td>6.0 hp</td>
<td>Second cycle</td>
</tr>
</tbody>
</table>

### Supplementary information
One profiles must be chosen:
Sustainable Energy Utilization,
Sustainable Power Generation,
Solar Energy (given at Högskolan Dalarna)
Turbomachinery
Transformation of Energy Systems: Policy and Management
Appendix 2: Specialisations

Master's Programme, Sustainable Energy Engineering, 120 credits (TSUEM), Programme syllabus for studies starting in autumn 2015

This programme has no specialisations.