Programme syllabus

Master's Programme, Energy Innovation, 120 credits
Masterprogram, innovativ energiteknik
120.0 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

The master's programme in Energy Innovation (InnoEnergy) is an umbrella programme which is directed towards a completely new type of education in the energy field, mobilising the innovative and entrepreneurial spirit of the students. At the same time, the full energy knowledge students receive in "classical" two year energy master programmes is kept. This will give the graduates a very deep understanding of the world's energy challenges paired with a significant insight into how energy businesses are created and into the industrial perspective of the energy side in different fields.

The KIC InnoEnergy MSc programmes are specially designed to accommodate the EIT/InnoEnergy label criteria.

Objectives of the study tracks:

• Smart Cities (SMCS)

This specialization deals with the concepts of “Smart Cities” based on scientific literature and reports from case studies.

Studies to investigate, analyze and explore “Smart City“ concepts and solutions in relation to the energy and climate mitigation challenges for important urban development sectors, such as transportation, buildings, consumption, lifestyle, energy production, waste management, water management, etc.

Team-based projects, related to energy and climate mitigation on an urban level together with a relevant stakeholder such as a waste company, the municipality, or a local energy or water utility.

• Smart Electrical Network and Systems (SENS)
SENS focus on how new technological developments electric power in combination with modern information technologies can transform the existing electric power grid infrastructure towards a more 'smart' power network.

After completion of SENS the students should be able to identify, explain, analyze and solve classical problems within the field of electric power engineering, but also analyze new concepts and innovations and their possibilities and limitations - all from idea to final product.

Be able to use models for: analysis of power flows, dynamic behaviour, stability conditions, regulations, electricity market, etc for the electric power system.

Know and apply principles for design, control and monitoring of the electric power grid and its components.

Be able to apply fundamental electromagnetic and physical principles in order to develop models and design criteria for electric power apparatuses and components including technologies that makes them 'smarter'.

Analyze and synthesize different methods for electric energy conversion based on rotating machines and power electronics.

- **Renewable Energy (RENE)**

  This specialization focuses on the renewable technologies, such as wind energy, concentrated solar thermal power, solar photovoltaic energy, ocean energy, hydro power and geothermal energy.

- **Nuclear Energy (NUEY)**

  This specialization deals nuclear energy engineering. The track is run in close collaboration with industrial partners and provides the latest trends in innovation in nuclear energy.

The track aims at giving the students not only technical knowledge, but also economical, organisational and managerial knowledge.

During the second year of studies students will be able to choose following tracks:

- **Materials for Nuclear Energy**
- **Decommissioning and nuclear waste**
- **Nuclear Fuel cycle**
- **Nuclear plant design**

**Knowledge and understanding**

For a master’s degree in Energy Innovation the student shall:

- Have knowledge and understanding of cutting-edge research and development and trends within industry
• Have knowledge and understanding of processes, methods, and tools used for development of specific technologies;

• Have knowledge of how to implement a business development process from idea to product.

**Skills and abilities**

For a master’s degree in Energy Innovation the student shall:

• be able to apply his/her knowledge and understanding, and problem solving abilities in new or unfamiliar environments within broader (or multidisciplinary) contexts related to the field of study.

• have the ability to think beyond boundaries and systematically explore and generate new ideas. (creative skills)

• have the ability to use knowledge, ideas or technologies to create new or significantly improved products, services, processes or policies or new business models. (innovation skills)

• have the ability to transform innovations into feasible business solutions. (entrepreneurial skills)

• have the ability to transform practical experiences into research problems and challenges. (intellectual transforming skills), and have the capability to work in cross-disciplinary teams in the thematic field of the KIC. (research skills)

• demonstrate leadership and decision-making, based on a holistic understanding of the contributions of higher education, research and business to value creation, in limited sized teams and contexts. (leadership skills)

• have the ability to communicate his/her conclusions, and the knowledge and rationale underpinning these, to specialist and non-specialist audiences clearly and unambiguously, both orally and in writing. (communication skills)

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

For a master’s degree in Energy Innovation the student shall:

• have the ability to integrate knowledge and handle complexity, and formulate judgements with incomplete or limited information;

• demonstrate an appreciation of ethical, scientific and sustainability challenges

**Extent and content of the programme**

The programme lasts for two academic years (120 ECTS) on the advanced level (second cycle). The language of instruction throughout the programme is English.

Tracks:
• Smart Cities (SMCS)
• Smart Electrical Networks and Systems (SENS)
• Renewable Energy (RENE)
• Nuclear Energy (NUEY)

**Eligibility and selection**

Basic eligibility to be accepted to the master’s programme requires that the applicant has a degree on the first level consisting of at least 180 higher education credits or a corresponding foreign degree.

Students in their final year of undergraduate education may also apply and receive a conditional offer if they are likely to complete their Bachelor’s degree at the latest at the date of programme registration. Information about the conditional acceptance shall be conveyed in the admission letter. A written statement from the Degree Administrations Office (or equivalent department), giving the expected completion date should be included in the application documents.

Applicants following longer technical programmes and who have completed courses equivalent to an amount of 180 ECTS, will be considered on a case-by-case basis.

**Language requirements**

Applicants must be able to show good knowledge of written and spoken English. If the requirements for English proficiency are higher at one of the partner universities than at KTH, this can influence KTH decision on admission. The requirements may however not be lower than those listed below.

Applicants must provide proof of their English language proficiency, which is most commonly established through an internationally recognized test. The following test results are accepted by KTH.

- TOEFL internet based test, total of 92, 22 writing section
- IELTS score of at least 6.5, no band lower than 6 (only academic training accepted)
- University of Cambridge ESOL Examinations (minimum grade C):
  - Certificate in Advanced English
  - Certificate of Proficiency

Some student groups may be exempted from taking an English proficiency test. For more information see the programme website.

**Specific eligibility**

**Smart Cities (SMCS)**
Bachelor's degree in electrical engineering or mechanical engineering. Degrees in Sciences, Economics or Management are eligible, but may be subject to preparatory courses.

**Smart Electrical Networks and Systems (SENS)**

- electrical engineering (including three phase electrical circuits or machines) equivalent to 60 higher education credits
- mathematics (calculus, numerical methods, algebra, probability theory) equivalent to at least 30 higher education credits.

**Renewable Energy (RENE)**

Bachelor of Science in Mechanical or Chemical Engineering and related disciplines

Coursework in engineering thermodynamics, heat transfer, and fluid mechanics, with 6 hp as the approximate minimum threshold.

**Nuclear Energy (NUEY)**

Bachelor degree (180 ECTS) in Engineering Physics, Mechanical Engineering, Materials Engineering, Chemical Engineering, or Power Engineering.

**Selection process**

The selection process is handled by the coordinating institution of each track. However it should be in accordance with KTH's admission regulations.

**Implementation of the education**

**Structure of the education**

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

Within the European Institute of Innovation and Technology (EIT) KTH participates in the Knowledge and Innovation Community (KIC) InnoEnergy. The Energy Innovation programme is an umbrella structure for the different master’s programmes offered within EIT KIC InnoEnergy. InnoEnergy aims to provide education programmes at master level with significant elements of innovation and entrepreneurship. All these programmes take place in cooperation with several other universities as well as partners in industry which offers internships to the students. These programmes will be designed as tracks within the Energy Innovation master's programme.

The Master's programme in Energy Innovation offers a heavy technical component in the traditional engineering sense combined with significant business and entrepreneurship activities throughout the
whole curriculum to educate fresh engineers with either a broad overall view of the energy area, a specialized education in one of the thematic areas of the CCs, or an overview of the “well-to wheel” polygeneration perspective.

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.

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 further studies, special admission requirements for the course are to be fulfilled. Special admission requirements are listed in the respective course syllabus.

Conditions for being promoted to the next level

For promotion to study year two at a partner university, the student should have passed all 60 credits from the first year, but a minimum of 45 higher education credits are obligatory.

Studies abroad

The Master's programme in Energy Innovation is given at two different European universities which are choosen by the time of application. The placement for the second year of studies is preliminary and may change depending on the orientation of the studies. Students can apply for "double degrees" from the two universities after completion of the studies.

For the different track, the following mobility options apply:

Smart Cities (SMCS)

First year: · KULeuven, KTH

Second year: · KULeuven, KTH, UPC, Grenoble INP

Smart Electrical Networks and Systems (SENS)

First year: KTH

Second year: INP Grenoble, KU Leuven, TU/e Eindhoven and UPC Barcelona

Renewable Energy (RENE)
First year: · ParisTech, IST, UPC, KTH

Second year: · ParisTech, IST, UPC, KTH

**Nuclear Energy (NUEY)**

First year: · KTH, UPC

Second year: · ParisTech, Grenoble INP

**Degree project**

The degree project is the final part of the education and comprises 30 higher education credits. The project work may begin when special admission requirements for the course are fulfilled.

The thesis should be implemented within the main field of study (depending on the selected track) and it is encouraged to link the thesis to industry.

**Degree**

Students who have successfully completed the two-year Master's programme in Energy Innovation (120 ECTS) can apply for a Degree of Master of Science (two years).

To be able to apply for the degree the student has to fulfill the national qualification requirements and have completed courses corresponding to 120 higher education credits including:

- out of which 90 credits are at the advanced level
- and at least 60 credits (including 30 credits for the thesis work) corresponds to advanced level courses within the major subject of the program

The name of the degree is Degree of Masters of Science (two years). The program name, Energy Innovation, is indicated on the diploma.

Students graduated from the program receive a degree from KTH and from the other university where they have studied a part of the program. The dual examinations are supplemented with an InnoEnergy certificate that documents the specific learning goals that meet the EIT Quality Score.

The main subject for the degree will be stated in the degree certificate.

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

Master's Programme, Energy Innovation, 120 credits (TIETM), Programme syllabus for studies starting in autumn 2019

Track, Nuclear Energy (NUEY)

Year 1

Mandatory courses (38.0 Credits)

<table>
<thead>
<tr>
<th>Course code</th>
<th>Course name</th>
<th>Credits</th>
<th>Edu. level</th>
</tr>
</thead>
<tbody>
<tr>
<td>SH2600</td>
<td>Nuclear Reactor Physics, Major Course</td>
<td>9.0 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>SH2603</td>
<td>Radiation, Protection, Dosimetry and Detectors</td>
<td>6.0 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>SH2612</td>
<td>Nuclear Power Safety</td>
<td>6.0 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>SH2702</td>
<td>Nuclear Reactor Technology</td>
<td>8.0 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>SH2706</td>
<td>Sustainable Energy Transformation Technologies</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>MJ2411</td>
<td>Renewable Energy Technology</td>
<td>6.0 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>SH2302</td>
<td>Nuclear Physics</td>
<td>8.0 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>SH2605</td>
<td>Radiation Damage in Materials</td>
<td>6.0 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>SH2610</td>
<td>Leadership for Safe Nuclear Power Industry</td>
<td>6.0 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>SH2611</td>
<td>Small Reactors</td>
<td>6.0 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>SH2613</td>
<td>Generation IV Reactors</td>
<td>6.0 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>SH262V</td>
<td>Elements of the Back-end of the Nuclear Fuel Cycle: Geological Storage in Precambrian Bedrock</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>SH2701</td>
<td>Thermal-Hydraulics in Nuclear Energy Engineering</td>
<td>6.0 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>SH2703</td>
<td>Nuclear Reactor Dynamics and Stability</td>
<td>6.0 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>SH2704</td>
<td>Monte Carlo Methods and Simulations in Nuclear Technology</td>
<td>6.0 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>SH2705</td>
<td>Compact Reactor Simulator- Exercises in Reactor Kinetics and Dynamics</td>
<td>6.0 hp</td>
<td>Second cycle</td>
</tr>
</tbody>
</table>
SH2772  Chemistry and Physics of Nuclear Fuels 8.0 hp  Second cycle
SH2774  Numerical Methods in Nuclear Engineering 6.0 hp  Second cycle

Supplementary information

Course list: Information is based upon the curriculum for academic year 2018/2019. Changes may occur.

At least 4 of the recommended elective courses should be selected.

Track, Renewable Energy (RENE)

Year 1

Mandatory courses (48.0 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>MJ1432</td>
<td>Practical Energy Related Project</td>
<td>9.0 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>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>MJ2424</td>
<td>Computational Methods in Energy Technology</td>
<td>6.0 hp</td>
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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>MJ2410</td>
<td>Energy Management</td>
<td>6.0 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>MJ2412</td>
<td>Renewable Energy Technology, Advanced Course</td>
<td>6.0 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>MJ2426</td>
<td>Applied Heat and Power Technology</td>
<td>6.0 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>MJ2500</td>
<td>Large Scale Solar Power</td>
<td>6.0 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>MJ2501</td>
<td>Solar Energy Systems for Buildings and Cities</td>
<td>6.0 hp</td>
<td>Second cycle</td>
</tr>
</tbody>
</table>

Supplementary information

Course list: Information is based upon the curriculum for academic year 2018/2019. Changes may occur.

Conditionally elective courses: chose at least 12 credits.
### Year 2

**Mandatory courses (9.0 Credits)**

<table>
<thead>
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<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>
</tbody>
</table>

**Optional courses**

<table>
<thead>
<tr>
<th>Course code</th>
<th>Course name</th>
<th>Credits</th>
<th>Edu. level</th>
</tr>
</thead>
<tbody>
<tr>
<td>EG2340</td>
<td>Wind Power Systems</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
<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>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>MJ2502</td>
<td>Industrial Dynamics of Innovation in Combined Energy</td>
<td>6.0 hp</td>
<td>Second cycle</td>
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</table>

**Conditionally elective courses**

<table>
<thead>
<tr>
<th>Course code</th>
<th>Course name</th>
<th>Credits</th>
<th>Edu. level</th>
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<tbody>
<tr>
<td>MJ2429</td>
<td>Turbomachinery</td>
<td>6.0 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>MJ2477</td>
<td>Energy Policy and Planning</td>
<td>6.0 hp</td>
<td>Second cycle</td>
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<tr>
<td>MJ2480</td>
<td>Introduction to Computational Fluid Dynamics and Mathematics</td>
<td>6.0 hp</td>
<td>Second cycle</td>
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</table>

**Track, Smart Electrical Networks and System (SENS)**

### Year 1

**Mandatory courses (43.5 Credits)**

<table>
<thead>
<tr>
<th>Course code</th>
<th>Course name</th>
<th>Credits</th>
<th>Edu. level</th>
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</thead>
<tbody>
<tr>
<td>EG2100</td>
<td>Power System Analysis</td>
<td>6.0 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>EI2455</td>
<td>Smart Electrical Networks and Systems</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>EI2600</td>
<td>Innovation and Entrepreneurship in Electric Power Engineering</td>
<td>6.0 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>EI2610</td>
<td>Industrial Innovation Project</td>
<td>12.0 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>EJ2201</td>
<td>Electrical Machines and Drives</td>
<td>6.0 hp</td>
<td>Second cycle</td>
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</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>AK2030</td>
<td>Theory and Methodology of Science (Natural and Technological Science)</td>
<td>4.5 hp</td>
<td>Second cycle</td>
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<tr>
<td>EG2110</td>
<td>Power System Stability and Control</td>
<td>7.5 hp</td>
<td>Second cycle</td>
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<tr>
<td>EG2200</td>
<td>Power Generation Operation and Planning</td>
<td>6.0 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>EG2210</td>
<td>Electricity Market Analysis</td>
<td>7.5 hp</td>
<td>Second cycle</td>
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<tr>
<td>EG2220</td>
<td>Power Generation, Environment and Markets</td>
<td>7.5 hp</td>
<td>Second cycle</td>
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<tr>
<td>EH2221</td>
<td>The Sustainable Electric Power Engineer</td>
<td>1.5 hp</td>
<td>Second cycle</td>
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<tr>
<td>EH2741</td>
<td>Communication and Control in Electric Power Systems</td>
<td>6.0 hp</td>
<td>Second cycle</td>
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<tr>
<td>EH2745</td>
<td>Computer Applications in Power Systems</td>
<td>4.5 hp</td>
<td>Second cycle</td>
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<tr>
<td>EH2770</td>
<td>IT Management with Enterprise Architecture I</td>
<td>7.5 hp</td>
<td>Second cycle</td>
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<tr>
<td>EI2430</td>
<td>High-voltage Engineering</td>
<td>7.5 hp</td>
<td>Second cycle</td>
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<tr>
<td>EI2436</td>
<td>Power Grid Technology and Substation Design</td>
<td>6.0 hp</td>
<td>Second cycle</td>
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<tr>
<td>EI2440</td>
<td>Electrotechnical Design</td>
<td>7.5 hp</td>
<td>Second cycle</td>
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<tr>
<td>EI2460</td>
<td>Batteries for Energy Storage in Electrical Systems</td>
<td>6.0 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>EI2490</td>
<td>Equipment</td>
<td>1.5 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>EJ2420</td>
<td>Seminars in Electrical Machines and Power Electronics</td>
<td>1.5 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>EL2450</td>
<td>Hybrid and Embedded Control Systems</td>
<td>7.5 hp</td>
<td>Second cycle</td>
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</table>

### Supplementary information

Course list: Information is based upon the curriculum for academic year 2018/2019. Changes may occur.

The program consists of mandatory and conditionally elective.
These courses are conditionally elective basic courses in Electric Power Engineering. Select a minimum of 6 credits from the conditionally elective courses following: EG2200, EH2741, EI2436 for your degree requirements.

These courses are conditionally elective advanced courses in Electric Power Engineering. Select a minimum of 10.5 credits from the conditionally elective advanced courses following: EH2221, AK2030, EL2450, EH2745, EH2770, EG2210, EG2220, EG2410, EI2490, EJ2420, EG2110 for your degree requirements.

Track, Smart Cities (SMCS)

Year 1

Mandatory courses (34.5 Credits)

<table>
<thead>
<tr>
<th>Course code</th>
<th>Course name</th>
<th>Credits</th>
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<tbody>
<tr>
<td>AL2115</td>
<td>Transdisciplinary Approaches for System Innovations</td>
<td>7.5 hp</td>
<td>Second cycle</td>
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<tr>
<td>EG2100</td>
<td>Power System Analysis</td>
<td>6.0 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>EJ2301</td>
<td>Power Electronics</td>
<td>6.0 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>MJ2443</td>
<td>Heating, Cooling and Indoor Climate</td>
<td>6.0 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>MJ2686</td>
<td>Smart Cities and Climate Mitigation Strategies, Larger Course - Project Based</td>
<td>9.0 hp</td>
<td>Second cycle</td>
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Recommended courses

<table>
<thead>
<tr>
<th>Course code</th>
<th>Course name</th>
<th>Credits</th>
<th>Edu. level</th>
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<tbody>
<tr>
<td>AL2155</td>
<td>Urban Economics and Cost Benefit Analysis</td>
<td>7.5 hp</td>
<td>Second cycle</td>
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<tr>
<td>AL2130</td>
<td>Waste Management</td>
<td>7.5 hp</td>
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<tr>
<td>AL2160</td>
<td>Environmental Management</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>EG2110</td>
<td>Power System Stability and Control</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>EG2210</td>
<td>Electricity Market Analysis</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>EH2741</td>
<td>Communication and Control in Electric Power Systems</td>
<td>6.0 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>EH2745</td>
<td>Computer Applications in Power Systems</td>
<td>4.5 hp</td>
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<tr>
<td>EH2770</td>
<td>IT Management with Enterprise Architecture I</td>
<td>7.5 hp</td>
<td>Second cycle</td>
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<tr>
<td>EI2600</td>
<td>Innovation and Entrepreneurship in Electric Power Engineering</td>
<td>6.0 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>EJ2201</td>
<td>Electrical Machines and Drives</td>
<td>6.0 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>EJ2230</td>
<td>Control in Electrical Energy Conversion</td>
<td>6.0 hp</td>
<td>Second cycle</td>
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<tr>
<td>ME2016</td>
<td>Project Management: Leadership and Control</td>
<td>6.0 hp</td>
<td>Second cycle</td>
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<tr>
<td>ME2063</td>
<td>Team Leadership and Human Resource Management</td>
<td>6.0 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>MJ1402</td>
<td>Introduction to Energy Technology</td>
<td>3.0 hp</td>
<td>First cycle</td>
</tr>
</tbody>
</table>
**Supplementary information**

Course list: Information is based upon the curriculum for academic year 2018/2019. Changes may occur.

Select a minimum of (3 cr.) the recommended elective courses.

**Year 2**

**Mandatory courses (43.5 Credits)**

<table>
<thead>
<tr>
<th>Course code</th>
<th>Course name</th>
<th>Credits</th>
<th>Edu. level</th>
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</thead>
<tbody>
<tr>
<td>EI2600</td>
<td>Innovation and Entrepreneurship in Electric Power Engineering</td>
<td>6.0 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>MJ2685</td>
<td>Smart Cities and Climate Mitigation Strategies- Project Based</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>MJ273X</td>
<td>Degree Project in Industrial Ecology, Second Cycle</td>
<td>30.0 hp</td>
<td>Second cycle</td>
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</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>AF2507</td>
<td>Sustainable Buildings - Concept, Design, Construction and Operation</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>AG2116</td>
<td>City Networks in Regional Contexts</td>
<td>7.5 hp</td>
<td>Second cycle</td>
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<tr>
<td>AG2806</td>
<td>Environmental Aspects of the Built Environment</td>
<td>7.5 hp</td>
<td>Second cycle</td>
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<tr>
<td>AH2170</td>
<td>Transport Data collection and Analysis</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>AL2181</td>
<td>Environmental System Analysis and Decision making</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>EH2720</td>
<td>Management of Projects</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>EJ2201</td>
<td>Electrical Machines and Drives</td>
<td>6.0 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>MJ2615</td>
<td>Introduction to Industrial Ecology, larger course</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
</tbody>
</table>

**Supplementary information**

Course list: Information is based upon the curriculum for academic year 2017/2018. Changes may occur.

For students starting year 2

At least 3-4 (22.5 cr) of the recommended elective courses should be selected
Appendix 2: Specialisations

Master's Programme, Energy Innovation, 120 credits (TIETM), Programme syllabus for studies starting in autumn 2019

**Track, Nuclear Energy (NUEY)**

This specialization deals nuclear energy engineering. The track is run in close collaboration with industrial partners and provides the latest trends in innovation in nuclear energy.

**Track, Renewable Energy (RENE)**

This specialization focuses on the renewable technologies where the partners of KIC InnoEnergy excel, such as wind energy, concentrated solar thermal power, solar photovoltaic energy, ocean energy, hydro power and geothermal energy.

**Track, Smart Electrical Networks and System (SENS)**

This education takes a starting point in the traditional education around electric power engineering, but turns its focus towards the electric power grid of the future -that is 'smart grids' - and how new concepts and ideas can lead to innovations within the framework of smart electrical networks and systems (smart grids).

**Track, Smart Cities (SMCS)**

This specialization deals with the concepts of “Smart Cities” based on scientific literature and reports from case studies.