Programme syllabus

Master's Programme, Electric Power Engineering, 120 credits
Masterprogram, elkraftteknik
120.0 credits

Valid for students admitted to the education from autumn 13 (HT - Autumn term; VT - Spring term).

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

Programme objectives

This programme covers all major fields in Electric Power Engineering including systems and components where electricity is principally used to transfer energy. The programme is concerned with understanding, modelling and analysing a wide range of topics related to design, operation, and control of individual power system components as well as power system in its entirety. After successful completion of the programme, participants shall be able to pursue an academic research career as well as a professional career in industry.

This programme is divided into the following three subject areas, namely:

1. Electric Power Systems (focusing on power system dynamics, stability and control, and on electricity markets),

2. Electrotechnical Design (focusing on the physical and technical fundamentals for design and maintenance of electrical low and high voltage components, equipment and systems)

3. Electrical Drives (focusing on electrical machines and power electronics).

Knowledge and understanding

For the Master’s degree, the student shall

• demonstrate knowledge and understanding in the field of Electric Power Engineering, including both broad knowledge of this field and a considerable degree of specialised knowledge in one of the three above mentioned subject areas as well as insight into current research and development work, and

• demonstrate specialised methodological knowledge in the field of Electric Power Engineering.

Skills and abilities

For the Master’s degree, the student shall

• demonstrate the ability to critically and systematically integrate knowledge and analyse, assess and deal with complex phenomena, issues and situations even with limited information

• demonstrate the ability to identify and formulate issues critically, autonomously and creatively as well as to plan and, using appropriate methods, undertake advanced tasks within predetermined time frames and so contribute to the formation of knowledge as well as the ability to evaluate this work

• demonstrate the ability in speech and writing both nationally and internationally to report clearly and discuss his or her conclusions and the knowledge and arguments on which they are based in dialogue with different audiences, and
• demonstrate the skills required for participation in research and development work or autonomous employment in some other qualified capacity.

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

For the Master’s degree, the student shall

• demonstrate the ability to make assessments in the field of Electric Power Engineering informed by relevant disciplinary, social and ethical issues and also to demonstrate awareness of ethical aspects of research and development work

• demonstrate insight into the possibilities and limitations of research, its role in society and the responsibility of the individual for how it is used, and

• demonstrate the ability to identify the personal need for further knowledge and take responsibility for his or her ongoing learning.

**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.

**Eligibility and selection**

**Basic admission requirements**

Basic eligibility to be accepted to the master’s programme requires a completed Bachelor's degree, corresponding to a Swedish Bachelor's degree (180 ECTS), or equivalent academic qualifications from an internationally recognised university. The university has to be listed in the latest edition of the International Handbook of Universities. Students should have in addition, good knowledge in English, oral and written, is required. Applicants must provide proof of their proficiency in English.

**Specific admission requirements**

Specific eligibility to the programme requires:

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

The specific eligibility requirements can be assessed as not-fulfilled if:

1. the GPA converted to a percentage grade is less than 75%,
2. the degree awarding institution is not considered to meet acceptable quality standards by the authorities of the country in which the institution is located,
3. the degree does not qualify for admission to equivalent Master level in the country where the degree is awarded.

**Selection process**

The selection process for Electric Power Engineering is based on a total evaluation of the following selection criteria: University, GPA, motivation letter, references, course work and working experiences relevant to the programme.

**Implementation of the education**

**Structure of the education**

Structure of the education
The programme lasts for two academic years. At KTH, the academic year is divided into two terms. The autumn term starts in late August and runs until the middle of January. The spring term begins in the middle of January and runs until the end of May/the beginning of June. The Christmas break is two weeks and the Easter break one week.

Each term consists of two study periods. Each study period comprises seven weeks of scheduled tuition such as lectures, laboratory lessons, etc., followed by one week of examinations free from scheduled tuition. There are also re-examination periods in January/February, June and August. The programme offers five compulsory courses (37.5 ECTS), four of which will be given in the first year, and the remaining one in the second year. The conditional elective and elective courses may be selected in both first and second year.

**Courses**

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

The programme is course-based. Lists of courses are included in appendix 1. Only the conditional elective courses from the list in this appendix can be selected.

**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.

All courses are graded on a scale from A to F. A-E are passing grades, A is the highest grade.

**Conditions for participation in the programme**

For promotion to Study Year Two, the student must have received at least 45 ECTS in Study Year One.

No later than November 15 and May 15 each academic year, respectively, the students are required to select the conditional elective and elective courses.

**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.

**Studies abroad**

The Degree project (Master’s Thesis project) can be performed abroad providing the student has a supervisor at KTH, and the project is examined by one of the examiners involved in the programme.

**Degree project**

The aim of the Degree project is to develop the student’s ability to independently carry out and report a work effort within the area of Electric Power Engineering.

The final degree project is worth 30 ECTS, and corresponds to five months of full-time study. It may be carried out either at KTH or in industry. The project is summarised in a written report, and orally presented at a seminar. The project work can begin if

- the student has an agreement with one of the examiners involved in the programme,

- the student has obtained 67.5 ECTS at least 30 of which are from completed compulsory courses, and at least 22.5 ECTS from completed conditional elective courses (1),

- the student has completed the courses relevant to the project subject.

The student may found an appropriate Degree project as follows:

- the Labs involved in the programme put available projects on their web pages,
the student contacts a company or an authority within the field of Electric Power Engineering,

- the student formulates her/his own project.

In the two latter alternatives, the project proposal must be approved by an examiner. Only projects where the student applies relevant knowledge within the field of Electric Power Engineering are accepted.

**Degree**

Students who have successfully completed a two-year Master's programme (120 ECTS) will be awarded a "Teknologiemasterexamen", translated into English as "Master of Science (120 credits)".

To be awarded the above Master’s degree, students must obtain 120 ECTS and meet the following degree requirements:

- all compulsory courses (37.5 ECTS) have been successfully completed,

- conditional elective courses (1) corresponding to at least 30 ECTS have been successfully completed,

- conditional elective courses (2) corresponding to at least 7.5 ECTS have been successfully completed,

- the final degree project (30 ECTS) has been successfully completed.

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

Master's Programme, Electric Power Engineering, 120 credits (TELPM), Programme syllabus for studies starting in autumn 2013

General courses

Year 1

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>EG2021</td>
<td>Power System Analysis, part 1</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>EI2433</td>
<td>Electrotechnical Modelling</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>EJ2200</td>
<td>Electrical Machines and Drives</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>EJ2300</td>
<td>Power Electronics</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
</tbody>
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Conditionally elective courses

<table>
<thead>
<tr>
<th>Course code</th>
<th>Course name</th>
<th>Credits</th>
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</tr>
</thead>
<tbody>
<tr>
<td>EG2050</td>
<td>System Planning</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>EG2060</td>
<td>Electricity Market Analysis</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>EG2070</td>
<td>FACTS and HVDC in Electric Power Systems</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>EG2110</td>
<td>Power System Stability and Control</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>EH2030</td>
<td>Business Development and Quality Management</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>EH2740</td>
<td>Computer Applications in Power Systems, basic course</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>EH2770</td>
<td>IT Management with Enterprise Architecture I</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>EI2430</td>
<td>High-voltage Engineering</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>EI2435</td>
<td>Power Grid Technology and Components</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>EI2440</td>
<td>Electrotechnical Design</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>EI2455</td>
<td>Smart Electrical Networks and Systems</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>EJ2210</td>
<td>Analysis of Electrical Machines</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>EJ2420</td>
<td>Seminars in Electrical Machines and Power Electronics</td>
<td>1.5</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>EG2040</td>
<td>Wind Power Systems</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
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</table>

Supplementary information

Elective courses;

All courses at KTH

Year 2

Mandatory courses (7.5 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>AK2036</td>
<td>Theory and Methodology of Science with Applications (Natural and Technological Science)</td>
<td>7.5</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>EG2080</td>
<td>Monte Carlo Methods in Engineering</td>
<td>6.0</td>
<td>Second cycle</td>
</tr>
<tr>
<td>EH2030</td>
<td>Business Development and Quality Management</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>EH2720</td>
<td>Management of Projects</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>EH2750</td>
<td>Computer Applications in Power Systems, Advanced Course</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>EJ2221</td>
<td>Design of Permanent Magnet Synchronous Machines</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>EJ2311</td>
<td>Modulation of Power Electronic Converters</td>
<td>6.0</td>
<td>Second cycle</td>
</tr>
<tr>
<td>EJ2420</td>
<td>Seminars in Electrical Machines and Power Electronics</td>
<td>1.5</td>
<td>Second cycle</td>
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Recommended courses

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<tbody>
<tr>
<td>EL2620</td>
<td>Nonlinear Control</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
</tbody>
</table>

Supplementary information

Elective courses;

All courses at KTH

Year 3
Appendix 2: Specialisations

Master's Programme, Electric Power Engineering, 120 credits (TELPM), Programme syllabus for studies starting in autumn 2013

This programme has no specialisations.