



# Programme syllabus

Master's Programme, Electric Power Engineering, 120 credits

Masterprogram, elkraftteknik

*120.0 credits*

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*Valid for students admitted to the education from autumn 14 (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 subject areas:**

- 1. Electric Power Systems (focusing on power system dynamics, stability and control, and on electricity markets)**
- 2. Information and Control Systems (focusing on planning, operation, and control of electric power systems)**
- 3. Electrotechnical Design (focusing on the physical and technical fundamentals for design and maintenance of electrical low and high voltage components, equipment and systems) ,**
- 4. 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 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

The Academic year starts at the end of August/beginning of September and ends at the end of May/beginning of June. The year is divided into two semesters, one in the autumn and one in the spring. Each of the semesters has two study periods. The study periods are about 7 weeks long and end in an exam period. In addition to the four exam periods at the end of the study periods there are three more exam periods, one after Christmas, one after May and one before the start of the Academic year.

The Program consists of one block with mandatory courses, three blocks of different conditionally elective courses, one block of completely freely elective courses, and the Master thesis project. More information about the course blocks is found under Appendix 1.

### 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.

**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**

**Each student is responsible for registering for the term at the beginning of each term. This is done via the "personal menu" on KTH's website. There is a limited time window for doing this. Term registration indicates that the student is active and opens the system so that results may also be reported.**

**Signing up for courses is done via <https://www.universityadmissions.se> . The system there for choosing courses is open from 1-15 November and 1-15 May, unless other information is posted.**

**Conditions for being promoted to the next level.**

**In order to be registered for elective courses in Term 3, you must have completed at least 45 higher education credits of course work.**

## **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 60 ECTS at least 24 ECTS of which are from "Basic courses in electric power engineering" and at least 15 ECTS from completed "Advanced courses in electric power engineering",**
- the student has completed the courses relevant to the project subject.**

**The student may find 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 "Teknologie masterexamen", 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:

- "Basic courses in electric power engineering" corresponding to at least 24 ECTS have been successfully completed,
- "Advanced courses in electric power engineering" corresponding to at least 22,5 ECTS have been successfully completed,
- "Project courses in electric power engineering" corresponding to exactly 9 ECTS have been successfully completed,
- "Complementary courses in electric power engineering" corresponding to exactly 10,5 ECTS have been successfully completed, and
- the final degree project (30 ECTS) has been successfully completed.

[Appendix 1 - Course list](#)

[Appendix 2 - Programme syllabus descriptions](#)



# Appendix 1: Course list

Programme syllabus for studies starting in autumn 2014, Master's Programme, Electric Power Engineering, 120 credits (TELPM)

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## General courses

### Year 1

#### Mandatory courses (10.5 Credits)

Code	Name	Credits	Edu. level
<a href="#">AK2030</a>	<a href="#">Theory and Methodology of Science (Natural and Technological Science)</a>	4.5 hp	Second cycle
<a href="#">EG2320</a>	<a href="#">Power Systems and Environment</a>	3.0 hp	Second cycle
<a href="#">EH2220</a>	<a href="#">The Sustainable Electric Power Engineer</a>	3.0 hp	Second cycle

#### Conditionally elective courses

Code	Name	Credits	Edu. level
<a href="#">EG2100</a>	<a href="#">Power System Analysis</a> <i>Conditionally elective basic course</i>	6.0 hp	Second cycle
<a href="#">EG2110</a>	<a href="#">Power System Stability and Control</a> <i>Conditionally elective advanced course</i>	7.5 hp	Second cycle
<a href="#">EG2120</a>	<a href="#">FACTS and HVDC in Electric Power Systems</a> <i>Conditionally elective advanced course</i>	7.5 hp	Second cycle
<a href="#">EG2200</a>	<a href="#">Power Generation Operation and Planning</a> <i>Conditionally elective basic course</i>	6.0 hp	Second cycle
<a href="#">EG2210</a>	<a href="#">Electricity Market Analysis</a> <i>Conditionally elective advanced course</i>	7.5 hp	Second cycle
<a href="#">EG2220</a>	<a href="#">Power Generation, Environment and Markets</a> <i>Conditionally elective advanced course</i>	7.5 hp	Second cycle
<a href="#">EG2311</a>	<a href="#">Power System Research Project, part 1</a> <i>Conditionally elective advanced course</i>	7.5 hp	Second cycle
<a href="#">EG2410</a>	<a href="#">Hybrid System Modelling and Simulation</a> <i>Conditionally elective advanced course</i>	7.5 hp	Second cycle
<a href="#">EH2741</a>	<a href="#">Communication and Control in Electric Power Systems</a> <i>Conditionally elective basic course</i>	6.0 hp	Second cycle
<a href="#">EH2745</a>	<a href="#">Computer Applications in Power Systems</a> <i>Conditionally elective advanced course</i>	4.5 hp	Second cycle

<a href="#">EH2770</a>	<a href="#">IT Management with Enterprise Architecture I</a> <i>Conditionally elective advanced course</i>	7.5 hp	Second cycle
<a href="#">EI2430</a>	<a href="#">High-voltage Engineering</a> <i>Conditionally elective advanced course</i>	7.5 hp	Second cycle
<a href="#">EI2433</a>	<a href="#">Electrotechnical Modelling</a> <i>Conditionally elective advanced course</i>	7.5 hp	Second cycle
<a href="#">EI2436</a>	<a href="#">Power Grid Technology and Substation Design</a> <i>Conditionally elective basic course</i>	6.0 hp	Second cycle
<a href="#">EI2440</a>	<a href="#">Electrotechnical Design</a> <i>Conditionally elective advanced course</i>	7.5 hp	Second cycle
<a href="#">EI2452</a>	<a href="#">Reliability Evaluation of Electrical Power Systems</a> <i>Conditionally elective advanced course</i>	7.5 hp	Second cycle
<a href="#">EI2455</a>	<a href="#">Smart Electrical Networks and Systems</a> <i>Conditionally elective advanced course</i>	7.5 hp	Second cycle
<a href="#">EJ2201</a>	<a href="#">Electrical Machines and Drives</a> <i>Conditionally elective basic course</i>	6.0 hp	Second cycle
<a href="#">EJ2301</a>	<a href="#">Power Electronics</a> <i>Conditionally elective basic course</i>	6.0 hp	Second cycle
<a href="#">EJ2311</a>	<a href="#">Modulation of Power Electronic Converters</a> <i>Conditionally elective advanced course</i>	6.0 hp	Second cycle
<a href="#">EJ2420</a>	<a href="#">Seminars in Electrical Machines and Power Electronics</a> <i>Conditionally elective advanced course</i>	1.5 hp	Second cycle
<a href="#">EJ2440</a>	<a href="#">Electric Transportation</a> <i>Conditionally elective advanced course</i>	6.0 hp	Second cycle
<a href="#">EL2450</a>	<a href="#">Hybrid and Embedded Control Systems</a> <i>Conditionally elective advanced course</i>	7.5 hp	Second cycle

### Supplementary information

The program consists of mandatory, conditionally elective and freely elective courses.

These courses are conditionally elective basic courses in Electric Power Engineering. Select a minimum of 24 credits from the conditionally elective courses following: EG2100, EG2200, EH2741, EI2436, EJ2301, EJ2201 for your degree requirements.

These courses are conditionally elective advanced courses in Electric Power Engineering. Select 22,5 credits from the conditionally elective advanced courses following: EL2450, EP2120, EP2500, EH2745, EH2770, EG2110, EG2120, EG2210, EG2220, EG2311, EG2312, EG2340, EG2410, EG2420, EI2402, EI2405, EI2437, EI2439, EI2430, EI2433, EI2440, EI2452, EI2455, EI2490, EJ2222, EJ2230, EJ2311, EJ2420, EJ2430 for your degree requirements.

These courses are conditionally elective project courses in Electric Power Engineering. Select 9 credits from the conditionally elective project courses following: EH2751, EI2520, EJ2120, EG2330 for your degree requirements.

With reservation for possible modification.

## Year 2

### Mandatory courses (3.0 Credits)

Code	Name	Credits	Edu. level
<a href="#">EH2220</a>	<a href="#">The Sustainable Electric Power Engineer</a>	3.0 hp	Second cycle

### Conditionally elective courses

Code	Name	Credits	Edu. level
<a href="#">EG2312</a>	<a href="#">Power System Research Project, part 2</a> <i>Conditionally elective advanced course</i>	7.5 hp	Second cycle
<a href="#">EG2330</a>	<a href="#">Power System Design, Project Course</a> <i>Conditionally elective project course</i>	9.0 hp	Second cycle
<a href="#">EG2340</a>	<a href="#">Wind Power Systems</a> <i>Conditionally elective advanced course</i>	7.5 hp	Second cycle
<a href="#">EG2420</a>	<a href="#">Monte Carlo Simulation Theory and Project</a> <i>Conditionally elective advanced course</i>	7.5 hp	Second cycle
<a href="#">EH2751</a>	<a href="#">Communication and Control in Power Systems - Project Course</a> <i>Conditionally elective project course</i>	9.0 hp	Second cycle
<a href="#">EI2402</a>	<a href="#">Electromagnetic compatibility</a> <i>Conditionally elective advanced course</i>	7.5 hp	Second cycle
<a href="#">EI2405</a>	<a href="#">Classical Electrodynamics</a> <i>Conditionally elective advanced course</i>	7.5 hp	Second cycle
<a href="#">EI2433</a>	<a href="#">Electrotechnical Modelling</a> <i>Conditionally elective advanced course</i>	7.5 hp	Second cycle
<a href="#">EI2437</a>	<a href="#">Advanced Measurements in Electrotechnical Systems</a> <i>Conditionally elective advanced course</i>	7.5 hp	Second cycle
<a href="#">EI2439</a>	<a href="#">Power System Protection</a> <i>Conditionally elective advanced course</i>	6.0 hp	Second cycle
<a href="#">EI2490</a>	<a href="#">Seminar Course in Electrotechnical Design and High Voltage Equipment</a> <i>Conditionally elective advanced course</i>	1.5 hp	Second cycle
<a href="#">EI2520</a>	<a href="#">Electromagnetic Engineering, Project Course</a> <i>Conditionally elective project course</i>	9.0 hp	Second cycle
<a href="#">EJ2120</a>	<a href="#">Electrical Energy Conversion - Project Course</a> <i>Conditionally elective project course</i>	9.0 hp	Second cycle
<a href="#">EJ2222</a>	<a href="#">Design of Electrical Machines</a> <i>Conditionally elective advanced course</i>	7.5 hp	Second cycle
<a href="#">EJ2420</a>	<a href="#">Seminars in Electrical Machines and Power Electronics</a> <i>Conditionally elective advanced course</i>	1.5 hp	Second cycle
<a href="#">EL2620</a>	<a href="#">Nonlinear Control</a> <i>Conditionally elective advanced course</i>	7.5 hp	Second cycle
<a href="#">EP2120</a>	<a href="#">Internetworking</a> <i>Conditionally elective advanced course</i>	7.5 hp	Second cycle
	<a href="#">Networked Systems Security</a>		



[EP2500](#) *Conditionally elective advanced course*

7.5 hp Second cycle

[IK2218](#) [Protocols and Principles of the Internet](#)  
*Conditionally elective advanced course*

6.0 hp Second cycle

### **Supplementary information**

The program consists of five blocks of courses and a thesis project. The blocks are: Compulsory courses, three groups of Conditionally Elective courses, from each such group of courses have a minimum number of credits should be consulted to get your degree, and finally a block of Freely Elective courses.

1. Compulsory Courses: EH2220, EH2320, AK2030, all courses must be passed to certify for the degree.

2. Basic Power Engineering (Conditionally Elective - group 1): EG2100, EG2200, EH2741, EI2436, EJ2301 EJ2201. Of these, at least 24 credits must be passed for to certify for the degree. It is free to take the courses either year 1 or year 2. However, please note that these are often the entry requirements for courses in Conditionally Elective - of group 2.

3. Advanced Power Engineering (Conditionally Elective - group 2): EG2110, EG2120, EG2210, EG2220, EG2311, EG2312, EG2340, EG2420, EH2745, EI2402, EI2405, EI2437, EI2439, EI2430, EI2433, EI2440, EI2452, EI2455, EI2490, EJ2222, EJ2230, EJ2311, EJ2420, EJ2440, EL1820, EL2520, EL2620, EL2450, EP2500, IK2218. Of these, at least 22.5 credits must be passed to certify for the degree. It is free to read the courses either year 1 or 2, so long as the necessary prerequisites are met.

4. Project courses in Power Engineering (Conditionally Elective - group 3): EH2751, EI2520, EJ2120, EG2330, of which at least 9 credits must be passed to certify for the degree.

5. Freely elective courses, of which are are a few recommendations: EQ2870, EP2510, SF2812, SF2822, EH2770, EH2030, ME2043, EL1150, MJ2411, MJ2410, DD2431, DD2425.

Changes may occur.



## Appendix 2: Specialisations

Programme syllabus for studies starting in autumn 2014, Master's Programme, Electric Power Engineering, 120 credits (TELPM)

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This programme has no specialisations.