



# 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 18 (HT - Autumn term; VT - Spring term).*

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

## Programme objectives

The Master's programme in Electric Power Engineering covers courses 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 a professional career in industry as well as an academic research career.

### 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 issues, 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 thereby contribute to the creation of knowledge as well as the ability to evaluate this work
- demonstrate the ability to orally and in writing clearly report 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 consists of 120 credits, corresponding to two years of full-time studies, and the courses are at the second cycle level. The language of instruction throughout the programme is English.

The programme includes the following subject areas:

1. Electric Power Systems focusing on power system dynamics, stability and control, as well as on electricity markets
2. Information and Control Systems focusing on automation, operation, and control of electric power systems
3. Electrotechnical Design focusing on the physical and technical fundamentals for design and maintenance of low and high voltage components, equipment and systems,
4. Electrical Energy conversion focusing on electrical machines and power electronics.

## Eligibility and selection

### Basic eligibility

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. In addition, good knowledge in English, oral and written, is required.

### Specific eligibility

Specific eligibility to the programme requires:

- electrical engineering (including three phase electrical circuits and/or machines) equivalent to 60 ECTS,
- mathematics (calculus, numerical methods, algebra, probability theory, basic control theory) equivalent to at least 30 ECTS.
- Good knowledge of English, equivalent to English 6.

### Selection process

The number of places in the masters program is limited. 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

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.

## 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.

The grades pass (P) and fail (F) are also used for the degree project.

Since the grading systems differ between different countries, the grades from studies abroad will not be transferred to the KTH grading system.

## Conditions for participation in the programme

Participation requires admission to courses within the programme and course registration. Course registration is done via the personal menu at [www.kth.se](http://www.kth.se). If the student decides not to take a course, then the student should notify the course administrator.

## Course Selection

The selection of courses for the coming term must be done by the student via the [www.antagning.se](http://www.antagning.se) with the students KTH-account:

- May 1-15th for the fall term
- November 1-15th for the spring term

## Conditions for further studies

For students starting their education from the autumn semester 2018, previous promotion requirements have been replaced with special admission requirements to each course. Admission requirements are specified in the course syllabus.

## Recognition of previous academic studies

According to the Swedish Higher Education Ordinance, a student who has gone through certain first-cycle study courses and study programmes with a passing result has the right to have such credit recognised for a corresponding course of education at another institution of higher education. The Program Director for the master's programme in Electric Power Engineering will make the decisions concerning recognition of entire courses. Awards of credits for parts of courses may be decided upon by an examiner. For further information on recognition of previous academic studies, see the KTH:s regelverk

## Studies abroad

Exchange studies are available through a number of agreements between KTH and other universities. The Degree project (Master's Thesis project) can be performed abroad providing the student has an advisor and examiner at KTH and an advisor at the receiving institution or company, and that the work follows the KTH regulations for a degree projects.

## 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.

General rules and guidelines for the thesis and grading of the thesis are described in the KTH regulations.

The degree project should be performed within the area of technology for which the degree is being prepared. The degree project is carried out individually and must be within an area corresponding to the courses which the student has taken. Before the degree project is started, it must be approved both by the KTH examiner and the program director.

The degree project is graded according to the P-F scale, using the three bases for assessment common to all grading at KTH: the engineering and scientific content, the process, and the presentation.

## **Degree**

Students who have successfully completed the two-year Master's programme in Electric Power Engineering (120 ECTS) can apply for a "Teknologie masterexamen", translated into English as "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:

- "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 at least 7,5 ECTS have been successfully completed,
- "Complementary courses in electric power engineering" corresponding to at least 4,5 ECTS have been successfully completed, and
- the final degree project (30 ECTS) has been successfully completed.

The student applies for their degree via the "Personal Menu" at [www.kth.se](http://www.kth.se).

KTH's local degree ordinance is available in their entirety in the KTH regulatory framework that can be found on the intranet. 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, Electric Power Engineering, 120 credits (TELPM), Programme syllabus for studies starting in autumn 2018

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## General courses

### Year 1

#### Mandatory courses (7.5 credits)

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| Course code | Course name   | Credits | Edu. level   |
|-------------|---|---------|--------------|
| AK2030      | Theory and Methodology of Science (Natural and Technological Science) | 4.5     | Second cycle |
| EH2220      | The Sustainable Electric Power Engineer                               | 3.0     | Second cycle |

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#### Conditionally elective courses

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| Course code | Course name   | Credits | Edu. level   |
|-------------|---|---------|--------------|
| EG2100      | Power System Analysis<br><i>Conditionally elective basic course</i>                               | 6.0     | Second cycle |
| EG2110      | Power System Stability and Control<br><i>Conditionally elective advanced course</i>               | 7.5     | Second cycle |
| EG2200      | Power Generation Operation and Planning<br><i>Conditionally elective basic course</i>             | 6.0     | Second cycle |
| EG2210      | Electricity Market Analysis<br><i>Conditionally elective advanced course</i>                      | 7.5     | Second cycle |
| EG2220      | Power Generation, Environment and Markets<br><i>Conditionally elective advanced course</i>        | 7.5     | Second cycle |
| EH2741      | Communication and Control in Electric Power Systems<br><i>Conditionally elective basic course</i> | 6.0     | Second cycle |
| EH2745      | Computer Applications in Power Systems<br><i>Conditionally elective advanced course</i>           | 4.5     | Second cycle |
| EI2430      | High-voltage Engineering<br><i>Conditionally elective advanced course</i>                         | 7.5     | Second cycle |
| EI2433      | Electrotechnical Modelling<br><i>Conditionally elective advanced course</i>                       | 7.5     | Second cycle |

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| Course code | Course name  | Credits | Edu. level   |
|-------------|--|---------|--------------|
| EI2436      | Power Grid Technology and Substation Design<br><i>Conditionally elective basic course</i>              | 6.0     | Second cycle |
| EI2440      | Electrotechnical Design<br><i>Conditionally elective advanced course</i>                               | 7.5     | Second cycle |
| EI2452      | Reliability Evaluation of Electrical Power Systems<br><i>Conditionally elective advanced course</i>    | 7.5     | Second cycle |
| EI2455      | Smart Electrical Networks and Systems<br><i>Conditionally elective advanced course</i>                 | 7.5     | Second cycle |
| EJ2201      | Electrical Machines and Drives<br><i>Conditionally elective basic course</i>                           | 6.0     | Second cycle |
| EJ2230      | Control in Electrical Energy Conversion<br><i>Conditionally elective advanced course</i>               | 6.0     | Second cycle |
| EJ2301      | Power Electronics<br><i>Conditionally elective basic course</i>  | 6.0     | Second cycle |
| EJ2311      | Modulation of Power Electronic Converters<br><i>Conditionally elective advanced course</i>             | 6.0     | Second cycle |
| EJ2420      | Seminars in Electrical Machines and Power Electronics<br><i>Conditionally elective advanced course</i> | 1.5     | Second cycle |
| EJ2440      | Electric Transportation<br><i>Conditionally elective advanced course</i>                               | 6.0     | Second cycle |
| EL2450      | Hybrid and Embedded Control Systems<br><i>Conditionally elective advanced course</i>                   | 7.5     | Second cycle |
| EL2520      | Control Theory and Practice, Advanced Course<br><i>Conditionally elective advanced course</i>          | 7.5     | Second cycle |
| EL2700      | Model Predictive Control   | 7.5     | Second cycle |
| EL2820      | Modelling of Dynamical Systems   | 7.5     | 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, AK2030, all courses must be passed to certify for the degree. For students following the program but not studying at KTH for two years, e.g. due to studies abroad, EH2220 is replaced by EH2221.

**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, EG2340, EG2420, EH2745, EI2402, EI2405, EI2430, EI2433, EI2437, EI2439, EI2440, EI2452, EI2455, EI2490, EJ2222, EJ2230, EJ2311, EJ2420, EJ2440, EL2820, EL2520, EL2620, EL2720, EL2450, EL2700, EL2820. 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):** EI2520, EH2720 of which at least 7,5 credits must be passed to certify for the degree.

**5. Freely elective courses, of which these are a few recommendations:** EQ2870, EP2120, EP2500, EP2510, SF2812, SF2822, EH2770, EH2030, ME2043, EL1150, MJ2411, MJ2410, DD2431, DD2425, IK2218

Changes may occur.

## Year 2

### Mandatory courses (3.0 credits)

| Course code            | Course name   | Credits | Edu. level   |
|------------------------|---|---------|--------------|
| <a href="#">EH2220</a> | <a href="#">The Sustainable Electric Power Engineer</a> | 3.0     | Second cycle |

### Conditionally elective courses

| Course code            | Course name   | Credits | Edu. level   |
|------------------------|---|---------|--------------|
| <a href="#">EG2340</a> | <a href="#">Wind Power Systems</a><br><i>Conditionally elective advanced course</i>   | 7.5     | Second cycle |
| <a href="#">EG2420</a> | <a href="#">Monte Carlo Simulation Theory and Project</a><br><i>Conditionally elective advanced course</i>                            | 7.5     | Second cycle |
| <a href="#">EH2720</a> | <a href="#">Management of Projects</a><br><i>Conditionally elective project course</i>  | 7.5     | Second cycle |
| <a href="#">EI2402</a> | <a href="#">Electromagnetic compatibility</a><br><i>Conditionally elective advanced course</i>  | 7.5     | Second cycle |
| <a href="#">EI2405</a> | <a href="#">Classical Electrodynamics</a><br><i>Conditionally elective advanced course</i>  | 7.5     | Second cycle |
| <a href="#">EI2439</a> | <a href="#">Power System Protection</a><br><i>Conditionally elective advanced course</i>  | 6.0     | Second cycle |
| <a href="#">EI2490</a> | <a href="#">Seminar Course in Electrotechnical Design and High Voltage Equipment</a><br><i>Conditionally elective advanced course</i> | 1.5     | Second cycle |
| <a href="#">EI2520</a> | <a href="#">Electromagnetic Engineering, Project Course</a><br><i>Conditionally elective project course</i>                           | 9.0     | Second cycle |
| <a href="#">EJ2222</a> | <a href="#">Design of Electrical Machines</a><br><i>Conditionally elective advanced course</i>  | 7.5     | Second cycle |
| <a href="#">EJ2420</a> | <a href="#">Seminars in Electrical Machines and Power Electronics</a><br><i>Conditionally elective advanced course</i>                | 1.5     | Second cycle |
| <a href="#">EL2620</a> | <a href="#">Nonlinear Control</a><br><i>Conditionally elective advanced course</i>  | 7.5     | Second cycle |

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**5. Freely elective courses, of which these are a few recommendations:** EQ2870, EP2120, EP2500, EP2510, SF2812, SF2822, EH2770, EH2030, ME2043, EL1150, MJ2411, MJ2410, DD2431, DD2425, IK2218  
Changes may occur.

## Year 3





## Appendix 2: Specialisations

Master's Programme, Electric Power Engineering, 120 credits (TELPM), Programme syllabus for studies starting in autumn 2018

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This programme has no specialisations.