



# 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 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 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.
5. Management, a wide base of electrical engineering courses are read and complemented with freely electable courses in economy, innovation and management.

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

The following special admission requirements must be fulfilled in order to be admitted:

- 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.

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

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

The programme comprises 2 years of full-time studies (120 higher education credits) including a half-year degree project (30 higher education credits).

## 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.

## 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 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 programme director.

## Degree

Students who have successfully completed the two-year Master's programme in Electric Power Engineering (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:

- 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 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 2019

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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 <i>Conditionally elective basic course</i>	6.0	Second cycle
EG2200	Power Generation Operation and Planning <i>Conditionally elective basic course</i>	6.0	Second cycle
EG2210	Electricity Market Analysis <i>Conditionally elective advanced course</i>	7.5	Second cycle
EG2220	Power Generation, Environment and Markets <i>Conditionally elective advanced course</i>	7.5	Second cycle
EH2741	Communication and Control in Electric Power Systems <i>Conditionally elective basic course</i>	6.0	Second cycle
EH2745	Computer Applications in Power Systems <i>Conditionally elective advanced course</i>	4.5	Second cycle
EI2430	High-voltage Engineering <i>Conditionally elective advanced course</i>	7.5	Second cycle
EI2433	Electrotechnical Modelling <i>Conditionally elective advanced course</i>	7.5	Second cycle
EI2436	Power Grid Technology and Substation Design <i>Conditionally elective basic course</i>	6.0	Second cycle

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Course code	Course name	Credits	Edu. level
EI2440	Electrotechnical Design <i>Conditionally elective advanced course</i>	7.5	Second cycle
EI2452	Reliability Evaluation of Electrical Power Systems <i>Conditionally elective advanced course</i>	7.5	Second cycle
EI2455	Smart Electrical Networks and Systems <i>Conditionally elective advanced course</i>	7.5	Second cycle
EJ2201	Electrical Machines and Drives <i>Conditionally elective basic course</i>	6.0	Second cycle
EJ2230	Control in Electrical Energy Conversion <i>Conditionally elective advanced course</i>	6.0	Second cycle
EJ2301	Power Electronics <i>Conditionally elective basic course</i>	6.0	Second cycle
EJ2311	Modulation of Power Electronic Converters <i>Conditionally elective advanced course</i>	6.0	Second cycle
EJ2420	Seminars in Electrical Machines and Power Electronics <i>Conditionally elective advanced course</i>	1.5	Second cycle
EJ2440	Electric Transportation <i>Conditionally elective advanced course</i>	6.0	Second cycle
EL2450	Hybrid and Embedded Control Systems <i>Conditionally elective advanced course</i>	7.5	Second cycle
EL2520	Control Theory and Practice, Advanced Course <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 four blocks of courses and a thesis project. The blocks are: Compulsory courses, two 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, EI2525, 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):** 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. 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 (21.0 credits)

Course code	Course name	Credits	Edu. level
<a href="#">EH2220</a>	<a href="#">The Sustainable Electric Power Engineer</a>	3.0	Second cycle
<a href="#">EI2520</a>	<a href="#">Electromagnetic Engineering, Project Course</a>	9.0	Second cycle
<a href="#">EI2525</a>	<a href="#">Electric Power Engineering Project</a>	9.0	Second cycle

### Conditionally elective courses

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

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**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):** 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. 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 2019

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This programme has no specialisations.