



# Programme syllabus

## Degree Programme in Electrical Engineering Civilingenjörsutbildning i elektroteknik *300.0 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 of Science in Engineering programme in Electrical Engineering aims to create and develop the engineering skills required to contribute to the development of electrical engineering products and systems, with applications such as energy supply, communication, robotics and automation, as well as medical technology.

### Knowledge and understanding

An engineer graduating from the Degree Programme in Electrical Engineering must

- have knowledge of the scientific foundation of electrical engineering and proven experience.
- be able to apply a creative and critical work approach in order to, within a given framework, formulate and solve problems with adequate methods and tools.
- be able to analyze electrical engineering problems through a systems perspective, with a holistic viewpoint of technical systems and their lifecycles; from the idea and needs to specifications, development, manufacturing, operation and decommissioning processes.
- exhibit the insight that problem-solving takes its point of departure in needs and functionality, with consideration to business conditions, environment and society.

### Skills and abilities

An engineer graduating from the Degree Programme in Electrical Engineering must

- have the ability to independently apply mathematics and science within the discipline of electrical engineering.
- have mastered and be able to independently apply significant relationships within electrical engineering as well as to be able to formulate, analyze and solve complex electrical engineering problems.

- be able to analyse technical problems from a systems perspective from the idea/need through its specification, development, manufacturing and operation.
- exhibit ample ability in engineering-related contexts to be able to communicate verbally and in writing with different target groups in Swedish and English, and to be able to discuss the conclusions as well as knowledgeably support the basis for such conclusions.
- exhibit the ability to co-operate, plan, lead and organize.
- be able to follow and utilize developments in knowledge within electrical engineering and to be aware of the primary features of current research and development in the field of technology

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

An engineer graduating from the Degree Programme in Electrical Engineering must

- exhibit insight into the possibilities and limitations of technology, its role in society, and the responsibility of mankind for how it is used nationally and internationally.
- exhibit an understanding of and respect for the significance of how electrical engineering affects people, society in general, and the environment with respect to limited natural resources.
- exhibit an awareness of the ethical aspects of research and development work.

## **Extent and content of the programme**

The Master of Science in Engineering programme in Electrical Engineering consists of 300 credits, which at normal study speed corresponds to five years of full time study. The programme's first three years are in the first cycle. The last two years are concluded in the second cycle. The final two years the student takes a specialization that coincides with a Master's programme.

The selection of elective Master's programmes can be changed, as the KTH programmes offered on master's level may change. Currently, the following Master's programmes constitute possible specializations:

Students in the Electrical engineering program have a guaranteed place in the following KTH's master's programs:

- Electromagnetics, Fusion and Space Engineering
- Electric Power Engineering
- Embedded Systems
- Medical Engineering
- Nano Technology
- Systems, Control and Robotics
- Engineering Physics
- Information and Network Engineering

- Machine learning

Students can also apply for International Programs, but admission is not guaranteed. These programs are:

- Energy Innovation: Track SENS
- ICT Innovation: Track Digital Media Technology, Track Embedded Systems, Track Internet Technology and Architecture

All these master's programme will lead to a degree in Electrical Engineering.

The first three years of the programme are taught in Swedish. The last 2 years are mainly taught in English.

## Eligibility and selection

General admission requirements and the following special admission requirements must be fulfilled in order to be admitted:

Mathematics 4 / Mathematics E, Physics 2 / Physics B and Chemistry 1 / Chemistry A, with the lowest grade E / Approved.

Selection is based on high school grades and results of the university examination, two thirds of the places are appointed on the basis of grades and one third on the basis of the university degree.

A proportion of students admitted to the program, maximum one third, will be admitted on the basis of results from a Mathematics and Physics test. Registration for the test is done as directed on the test website.

## 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 program in Electrical Engineering during the first three years consists mainly of compulsory courses in mathematics, electrical systems and physics. The fourth year, the student chooses from several available specialisations in conjunction with a Master's program.

### 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.

## **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.

In order to be eligible for advanced level studies within the integrated Master of Science programmes at KTH, you are required to complete 150 credits from year one through three. Of these, 110 credits must be from the year 1 and 2 curriculum. In addition to these credits, the bachelor thesis needs to be completed before Master's level studies commence.

Additional specific eligibility requirements may exist for certain programs. These can be found in the programme syllabuses of the respective program.

## **Degree project**

Within the education there are requirements for the implementation of two degree project courses. The degree project in the first cycle comprises 15 higher education credits and the degree project in the second cycle 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 individually and the subject should normally be an in-depth study within the area of technology for which the degree is being prepared. Additional specific requirements may exist for certain degree project. These can be found in the course syllabuses of the respective degree project.

## **Degree**

After the educational programme has been completed the student can apply for three degrees if the qualification requirements are fulfilled:

- 1) Degree of Bachelor of Science, 180 credits
- 2) Degree of Master of Science in Engineering, 300 credits
- 3) Degree of Master of Science, 120 credits

The main field of the degree (Electrical Engineering) is indicated in the text of the diploma.

[Appendix 1 - Course list](#)

[Appendix 2 - Programme syllabus descriptions](#)



# Appendix 1: Course list

Degree Programme in Electrical Engineering (CELTE), Programme syllabus for studies starting in autumn 2019

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## General courses

### Year 1

#### Mandatory courses (64.5 Credits)

Course code	Course name	Credits	Edu. level
<a href="#">DD1316</a>	<a href="#">Programming Techniques and C</a>	6.0 hp	First cycle
<a href="#">EH1010</a>	<a href="#">Project Course in Electrical Engineering</a>	7.5 hp	First cycle
<a href="#">EH1110</a>	<a href="#">Global Impact of Electrical Engineering</a>	7.5 hp	First cycle
<a href="#">EI1110</a>	<a href="#">Electrical Circuit Analysis, Extended Course</a>	9.0 hp	First cycle
<a href="#">EP1200</a>	<a href="#">Introduction to Computing Systems Engineering</a>	6.0 hp	First cycle
<a href="#">IE1205</a>	<a href="#">Digital Design</a>	6.0 hp	First cycle
<a href="#">SF1624</a>	<a href="#">Algebra and Geometry</a>	7.5 hp	First cycle
<a href="#">SF1625</a>	<a href="#">Calculus in One Variable</a>	7.5 hp	First cycle
<a href="#">SF1626</a>	<a href="#">Calculus in Several Variable</a>	7.5 hp	First cycle

#### Supplementary information

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

### Year 2

#### Mandatory courses (54.0 Credits)

Course code	Course name	Credits	Edu. level
<a href="#">ED1110</a>	<a href="#">Vector Analysis</a>	4.5 hp	First cycle
<a href="#">EH1110</a>	<a href="#">Global Impact of Electrical Engineering</a>	7.5 hp	First cycle
<a href="#">EI1220</a>	<a href="#">Electromagnetic Theory E</a>	10.5 hp	First cycle
<a href="#">EN1020</a>	<a href="#">Project Course in Electrical Engineering, part II</a>	6.0 hp	First cycle

<a href="#">EQ1110</a>	<a href="#">Continuous Time Signals and Systems</a>	6.0 hp	First cycle
<a href="#">EQ1120</a>	<a href="#">Discrete Time Signals and Systems</a>	6.0 hp	First cycle
<a href="#">SF1920</a>	<a href="#">Probability Theory and Statistics</a> replaces SF1901	6.0 hp	First cycle
<a href="#">SK1108</a>	<a href="#">Classical physics, mechanics and waves</a>	7.5 hp	First cycle

### Conditionally elective courses

Course code	Course name	Credits	Edu. level
<a href="#">DD1320</a>	<a href="#">Applied Computer Science</a>	6.0 hp	First cycle
<a href="#">DD1388</a>	<a href="#">Program System Construction Using C++</a>	7.5 hp	First cycle
<a href="#">EI1222</a>	<a href="#">Electromagnetic Theory, Continuation Course</a>	6.0 hp	First cycle
<a href="#">EP1100</a>	<a href="#">Data Communications and Computer Networks</a>	7.5 hp	First cycle
<a href="#">IH1611</a>	<a href="#">Semiconductor Devices</a>	7.5 hp	First cycle
<a href="#">MH1023</a>	<a href="#">Practical Gender Equality and Diversity Work in Scientific, Technical and Industrial Environments</a>	6.0 hp	First cycle
<a href="#">SF1546</a>	<a href="#">Numerical Methods, Basic Course</a>	6.0 hp	First cycle
<a href="#">SF1662</a>	<a href="#">Discrete Mathematics</a>	7.5 hp	First cycle
<a href="#">SF1691</a>	<a href="#">Complex Analysis</a> replaces SF1628	7.5 hp	First cycle
<a href="#">SF1861</a>	<a href="#">Optimization</a>	6.0 hp	First cycle
<a href="#">SH1012</a>	<a href="#">Modern Physics</a>	8.0 hp	First cycle
<a href="#">SK1119</a>	<a href="#">Thermodynamics and Statistical Physics</a>	7.5 hp	First cycle

### Supplementary information

The program consists of compulsory courses , conditionally elective courses and elective courses.

When you apply for your bachelor's degree, you should have read 3 conditionally elective courses and one elective course. There is room in the schedule to read two of the courses in the spring in the second year and two in the spring of third year (to be a for full-time student and eligible for student aid, you need to be registered on courses equivalent to 30 credits per semester).

These courses are conditionally elective for grades 2 and 3. Select at least 3 of the following courses for your exam : DD1320, EI1222, EP1100, SF1546, SF1662, SF1691, SF1861, IH1611, DD1388, SH1012, MH1023.

Regarding scheduling conflicts: Only compulsory courses is guaranteed not to collide with other compulsory courses.

Conditionally Elective courses are scheduled collision-free when possible. If you take a course which is not listed as a compulsory course in your academic plan, you must yourself (when selecting courses) make sure that it does not clash with other courses that you plan to read.

### Year 3

## Mandatory courses (52.5 Credits)

Course code	Course name	Credits	Edu. level
<a href="#">EF112X</a>	<a href="#">Degree Project in Electrical Engineering, First Cycle</a> Replaces EF111X	15.0 hp	First cycle
<a href="#">EH1110</a>	<a href="#">Global Impact of Electrical Engineering</a>	7.5 hp	First cycle
<a href="#">EJ1200</a>	<a href="#">Electric Power Systems</a>	6.0 hp	First cycle
<a href="#">EK1191</a>	<a href="#">Measurement Technology</a>	6.0 hp	First cycle
<a href="#">EL1000</a>	<a href="#">Automatic Control, General Course</a>	6.0 hp	First cycle
<a href="#">EQ1270</a>	<a href="#">Stochastic Signals and Systems</a>	6.0 hp	First cycle
<a href="#">IE1207</a>	<a href="#">Analog Electronics</a>	6.0 hp	First cycle

## Conditionally elective courses

Course code	Course name	Credits	Edu. level
<a href="#">DD1320</a>	<a href="#">Applied Computer Science</a>	6.0 hp	First cycle
<a href="#">DD1388</a>	<a href="#">Program System Construction Using C++</a>	7.5 hp	First cycle
<a href="#">EI1222</a>	<a href="#">Electromagnetic Theory, Continuation Course</a>	6.0 hp	First cycle
<a href="#">IH1611</a>	<a href="#">Semiconductor Devices</a>	7.5 hp	First cycle
<a href="#">MH1023</a>	<a href="#">Practical Gender Equality and Diversity Work in Scientific, Technical and Industrial Environments</a>	6.0 hp	First cycle
<a href="#">SF1547</a>	<a href="#">Numerical Methods, Basic Course</a>	6.0 hp	First cycle
<a href="#">SF1662</a>	<a href="#">Discrete Mathematics</a>	7.5 hp	First cycle
<a href="#">SF1691</a>	<a href="#">Complex Analysis</a> replaces SF1628	7.5 hp	First cycle
<a href="#">SF1861</a>	<a href="#">Optimization</a>	6.0 hp	First cycle
<a href="#">SH1012</a>	<a href="#">Modern Physics</a>	8.0 hp	First cycle
<a href="#">SK1119</a>	<a href="#">Thermodynamics and Statistical Physics</a>	7.5 hp	First cycle

## Supplementary information

The program consists of compulsory courses, conditionally elective courses and elective courses.

When you apply for your bachelor's degree, you should have read 3 conditionally elective courses and one elective course. There is room in the schedule to read two of the courses in the spring in the second year and two in the spring of third year (to be a for full-time student and eligible for student aid, you need to be registered on courses equivalent to 30 credits per semester).

These courses are conditionally elective for grades 2 and 3. Select at least 3 of the following courses for your exam : DD1320, EI1222, EP1100, SF1546, SF1662, SF1691, SF1861, IH1611, DD1388, SH1012, MH1023.







## Appendix 2: Specialisations

Degree Programme in Electrical Engineering (CELTE), Programme syllabus for studies starting in autumn 2019

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This programme has no specialisations.