



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

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

## Programme objectives

For a Master's Degree in Electrical Engineering, a student must fulfill the goals that are specified in the Swedish Higher Education degree ordinance for a Master of Science degree in engineering (civilingenjör).

### The programme's aim

Electrical Engineering education is comprised of basic mathematics, natural science and their technical applications. The study programme offers a broad knowledge base which can be applied within widely varying fields.

### Knowledge and understanding

An engineer graduating from the Degree Programme in Electrical Engineering must

1. have knowledge of the scientific foundation of electrical engineering and proven experience.
2. 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.
3. be able to analyse 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.
4. 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

5. have the ability to independently apply mathematics and science within the discipline of electrical engineering
6. have mastered and be able to independently apply significant relationships within electrical engineering as well as to be able to formulate, analyse and solve complex electrical engineering problems
7. be able to analyse technical problems from a systems perspective from the idea/need through its specification, development, manufacturing and operation
8. 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 the knowledge and argumentation that form the basis for such

9. exhibit the ability to co-operate, plan, lead and organise

10. be able to follow and utilise 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

11. exhibit insight into the possibilities and limitations of the technology, its role in society, and the responsibility of mankind for how it is used nationally and internationally

12. 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

13. exhibit an awareness of the ethical aspects of research and development work

#### *KTH's local degree ordinance*

The goal of the Master of Science of Engineering Degree is to create and develop the engineering competency that is needed in order to effectively and efficiently exploit technology in the service of both the individual as well as society in general. A Master of Science in Engineering Degree is awarded after the educational programme has been completed. Programmes must be designed such that students, upon receiving the degree, have fulfilled the national requirements for the degree and completed courses totalling 300 credits.

All information about the degree requirements for the Master of Science in Engineering degree, student Bachelor's Degree, and respective masters degrees can be found in KTHs local degree ordinance.

<http://intra.kth.se/regelverk/utbildning-forskning/grundutbildning/examina/1.27227>

### **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 and can be concluded with a technology Bachelor's Degree, if the student applies to do so. The last two years are concluded in the second cycle and can be concluded with a technology Master's Degree.

The first three years of the programme are mainly in Swedish, with certain English literature included. The last 2 years are mainly in English.

The master's programme that will give a degree in Electrical Engineering will have contents corresponding to

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

Besides KTH's master's programs where the student has a guaranteed place, 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

## Eligibility and selection

For eligibility requirements and selection methods, see KTH's admission policy,

<http://intra.kth.se/regelverk/utbildning-forskning/grundutbildning/antagning/1.27186>

In addition a part of the students in the first grade are admitted through one, for the students, voluntary Mathematics and physics test.

[www.matematik-och-fysikprovet.se](http://www.matematik-och-fysikprovet.se).

## Implementation of the education

### Structure of the education

The study year for KTH's education is divided into four periods. Every study period is followed by an exam period. For details about the structure of the academic year, see KTH-handboken.

The program for Electrical Engineering during the first three years consists mainly of obligatory courses in mathematics, electrical systems and physics. The fourth year, the student chooses from several available specialisations in conjunction with a Master's program. By following one of these programs, the student will be eligible for both a degree in Electrical Engineering and also a Master's degree in the chosen specialty.

The study programme is designed so that after 3 years, the student will have the possibility to acquire a Bachelor degree in order to, if desired, continue his/her studies in another program at KTH (other than the suggested specializations) or another University in Sweden, abroad, or pursue a career.

### Courses

The programme is course-based. Lists of courses are included in [appendix 1](#).

The programme is composed of compulsory, conditionally elective and elective courses. The compulsory, conditionally elective and recommended elective courses are defined for every study year and specialization in the teaching and time schedule. The goals, prerequisites, contents and examination requirements for each course can be found in the Course and Program Directory on the KTH student web.

### 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.

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

### Conditions for participation in the programme

#### Semester enrollment

A precondition for being admitted to participate in studies at KTH is that the student enroll for the semester. Registration on the "Mina sidor" at KTH's Web site, is only possible at beginning of the term.

#### Registration at the program

Registration for the program shows that you intend to study the program during the specified semester. It is essential for you to register for courses belonging to the program.

Students who are not promoted to next level can not make registration for the program , therefore they have to make an individual study plan with their counselors.

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

The following promotion requirements apply in order to participate in the next level of the education.

From study year 1 to study year 2: A total of at least 45 ECTS credits from study year 1 must be completed.

From study year 2 to study year 3:

A total of at least 90 ECTS credits from study years 1 and 2.

From study year 3 to study year 4:

A total of at least 150 ECTS credits from study years 1-3.

### **Selection of masterprogram**

Selection of masterprogram will be done in the spring year 3.

### **Course registration**

Registration of a course assumes course selection in Ladok. The course selection process can be done on the web or through the student's programme office. Registration of a course is done by the laboratory giving the course. Registration must be finished by around three weeks after the course's start. If the student decides to withdraw from a course, the student must notify the laboratory of this.

### **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 Director of Undergraduate Studies (Grundutbildningsansvarig) at the School of Electrical Engineering will make the decisions concerning recognition of entire courses. Awards of credits for parts of courses may be decided upon by an examiner.

The application for recognition should be submitted to the programme office using the form intended for that purpose.

For further information on recognition of previous academic studies, see the KTH:s regelverk

<http://intra.kth.se/regelverk/utbildning-forskning/grundutbildning/prestationer/1.27200>

### **Studies abroad**

KTH has agreements with over 250 universities around the entire world, providing possible opportunities to study abroad. Exchange studies involve a student exchanging part of their time at KTH for time at another university abroad, with this normally being done during the third or fourth academic years. The last day to apply is around the middle of January and the selections are based upon the results of the earlier studies at KTH.

### **Degree project**

The degree project consists of 30 credits. A major part of the studies, at least 240 credits, must have been completed, with a maximum of two foundation courses remaining uncompleted before the degree project is commenced. The degree project may be performed individually or together with another student and the subject must normally be an in-depth study within the area of technology for which the degree is being prepared. The degree project is graded according to the A-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**

A Master of Engineering Degree is awarded after the educational programme has been completed.

Titel of Degree

- 1) "Degree of Bachelor of Science"
- 2) "Master of Engineering – Degree Programme in Electrical Engineering".
- 3) "Masters degree of Science"

KTH's local degree ordinance can be found in its entirety in the KTH:s regelverk:

<http://intra.kth.se/regelverk/utbildning-forskning/grundutbildning/examina/lokala-foreskrifter-for-examina-pa-grundniva-och-avancerad-niva-lokal-examensordning-1.27227>

[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 2014

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## General courses

### Year 1

#### Mandatory courses (64.5 credits)

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

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### Year 2

#### Mandatory courses (52.5 credits)

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| Course code | Course name                                       | Credits | Edu. level  |
|-------------|---|---------|-------------|
| ED1110      | Vector Analysis                                   | 4.5     | First cycle |
| EH1020      | Project Course in Electrical Engineering, part II | 4.5     | First cycle |
| EH1110      | Global Impact of Electrical Engineering           | 7.5     | First cycle |
| EI1220      | Electromagnetic Theory E                          | 10.5    | First cycle |
| EQ1110      | Continuous Time Signals and Systems               | 6.0     | First cycle |
| EQ1120      | Discrete Time Signals and Systems                 | 6.0     | First cycle |
| IF1603      | Classical physics, mechanics and waves            | 7.5     | First cycle |

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| <b>Course code</b> | <b>Course name</b>                | <b>Credits</b> | <b>Edu. level</b> |
|--------------------|-----------------------------------|----------------|-------------------|
| SF1901             | Probability Theory and Statistics | 6.0            | First cycle       |

#### Conditionally elective courses

| <b>Course code</b> | <b>Course name</b>                          | <b>Credits</b> | <b>Edu. level</b> |
|--------------------|---|----------------|-------------------|
| DD1332             | Object Oriented Programming                 | 7.5            | First cycle       |
| EI1222             | Electromagnetic Theory, Continuation Course | 6.0            | First cycle       |
| EP1100             | Data Communications and Computer Networks   | 7.5            | First cycle       |
| IF1614             | Thermodynamics and Statistical Physics      | 7.5            | First cycle       |
| SF1547             | Numerical Methods, Basic Course             | 6.0            | First cycle       |
| SF1628             | Complex Analysis                            | 6.0            | First cycle       |
| SF1662             | Discrete Mathematics                        | 7.5            | First cycle       |
| SF1861             | Optimization                                | 6.0            | First cycle       |
| SH1012             | Modern Physics                              | 8.0            | First cycle       |

### Year 3

#### Mandatory courses (52.5 credits)

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

#### Conditionally elective courses

| <b>Course code</b> | <b>Course name</b>                          | <b>Credits</b> | <b>Edu. level</b> |
|--------------------|---|----------------|-------------------|
| DD1332             | Object Oriented Programming                 | 7.5            | First cycle       |
| EI1222             | Electromagnetic Theory, Continuation Course | 6.0            | First cycle       |
| EP1100             | Data Communications and Computer Networks   | 7.5            | First cycle       |

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| <b>Course code</b> | <b>Course name</b>                     | <b>Credits</b> | <b>Edu. level</b> |
|--------------------|--|----------------|-------------------|
| IF1614             | Thermodynamics and Statistical Physics | 7.5            | First cycle       |
| SF1547             | Numerical Methods, Basic Course        | 6.0            | First cycle       |
| SF1628             | Complex Analysis                       | 6.0            | First cycle       |
| SF1662             | Discrete Mathematics                   | 7.5            | First cycle       |
| SF1861             | Optimization                           | 6.0            | First cycle       |
| SH1012             | Modern Physics                         | 8.0            | First cycle       |

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**Year 4**

**Year 5**





## Appendix 2: Specialisations

Degree Programme in Electrical Engineering (CELTE), Programme syllabus for studies starting in autumn 2014

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This programme has no specialisations.