Programme syllabus

Degree Programme in Electrical Engineering
Civilingenjörsutbildning i elektroteknik
300.0 credits

Valid for students admitted to the education from autumn 16 (HT - Autumn term; VT - Spring term).

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

Programme objectives

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 so that students, upon receiving the degree, have fulfilled the national requirements for the degree and completed courses totalling 300 credits. 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

Studies in Electrical Engineering are comprised of basic mathematics, natural science and their technical applications. The study programme offers a broad knowledge base which can be applied in 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 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.
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, analyze 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 knowledgeably support the basis for such conclusions.

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

10. 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

11. 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.

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.

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 KTH’s local degree ordinance.

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 taught in Swedish. The last 2 years are mainly taught in English.

**Eligibility and selection**

For selection methods, see KTH’s admission policy.

A proportion of students admitted to the program will be admitted on the basis of results from a voluntary Mathematics and Physics test.

www.matematik-och-fysikprovet.se.

**Implementation of the education**

**Structure of the education**

The study year for KTH's undergraduate education is divided into two semesters, each with two study periods (four study periods in total over the year). Each study period is followed by an exam period. For detailed information about the academic year please see the KTH student web

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. 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, it is possible to acquire a Bachelor degree in order to, if desired, continue studies in another program at KTH (other than the suggested specializations) at another University in Sweden, abroad, or else to pursue a career.

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

- Electrophysics
- 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.

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.

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

Registration for the term

All students accepted to a programme must register for each term they intend to actively pursue studies. For newly admitted students this is done in connection with the compulsory registration meeting at beginning of term. For all following terms of the program, the student enters the registration for the term via their Personal Menu at www.kth.se. The registration is possible during a limited time period. This registration is necessary for reporting of results and required so that student’s stipend (studiemedel) can be disbursed by CSN.

Course Selection

The student selects courses for the first time during their third semester. The selection of courses for the coming term must then be done:

- May 1-15th for the fall term
- November 1-15th for the spring term
Each student must before every study period register for all courses they are admitted. The course registration is either done via the Personal Menu at www.kth.se or according to instructions from the course coordinator or the department giving the course. If the student decides not to take a course, then the student should notify the course administrator.

Conditions for being promoted to the next level

For studies in study year 2:

At least 45 credits from study year 1 must be completed by August before beginning study year 2.

For studies in study year 3:

At least 90 credits from years 1-2 must be completed by August before beginning study year 3 (of which at least 50 credits from year 1).

For studies in study year 4 (master's program):

Total 150 credits from year 1, year 2 and year 3 of which 110 in year 1 and 2 and a completed Bachelor's degree project.

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

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 study time at KTH for study time at another university abroad, with this normally being done during the third or fourth academic year. The last day to apply occurs in the middle of January and the selections are based upon the results of earlier studies at KTH.

More information on studies abroad can be found on the student web.

Degree project
The degree project consists of 30 credits. A major part of the programme studies, at least 240 credits, must have been completed, with a maximum of two first cycle courses remaining uncompleted before the degree project is commenced. The degree project should be performed individually 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 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

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"

2) "Master of Engineering – Degree Programme in Electrical Engineering".

3) "Masters degree of Science"

The student applies for their degree via the "Personal Menu" at www.kth.se.

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

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 2016

General courses

Year 1

Mandatory courses (64.5 Credits)

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

Recommended courses

<table>
<thead>
<tr>
<th>Course code</th>
<th>Course name</th>
<th>Credits</th>
<th>Edu. level</th>
</tr>
</thead>
<tbody>
<tr>
<td>SD1105</td>
<td>Matlab</td>
<td>3.0 hp</td>
<td>First cycle</td>
</tr>
</tbody>
</table>

Supplementary information

Information is based upon the curriculum for academic year 2015/2016. Changes may occur.

Year 2

Mandatory courses (54.0 Credits)
### Course code | Course name | Credits | Edu. level
--- | --- | --- | ---
ED1110 | Vector Analysis | 4.5 hp | First cycle
EH1110 | Global Impact of Electrical Engineering | 7.5 hp | First cycle
EI1220 | Electromagnetic Theory E | 10.5 hp | First cycle
EN1020 | Project Course in Electrical Engineering, part II | 6.0 hp | First cycle
EQ1110 | Continuous Time Signals and Systems | 6.0 hp | First cycle
EQ1120 | Discrete Time Signals and Systems | 6.0 hp | First cycle
SF1920 | Probability Theory and Statistics | 6.0 hp | First cycle
SK1108 | Classical physics, mechanics and waves | 7.5 hp | First cycle

### Conditionally elective courses

| Course code | Course name | Credits | Edu. level
--- | --- | --- | ---
DD1320 | Applied Computer Science | 6.0 hp | First cycle
DD1388 | Program System Construction Using C++ | 7.5 hp | First cycle
EI1222 | Electromagnetic Theory, Continuation Course | 6.0 hp | First cycle
EP1100 | Data Communications and Computer Networks | 7.5 hp | First cycle
IH1611 | Semiconductor Devices | 7.5 hp | First cycle
SF1546 | Numerical Methods, Basic Course | 6.0 hp | First cycle
SF1628 | Complex Analysis | 6.0 hp | First cycle
SF1662 | Discrete Mathematics | 7.5 hp | First cycle
SF1861 | Optimization | 6.0 hp | First cycle
SH1012 | Modern Physics | 8.0 hp | First cycle
SK1119 | Thermodynamics and Statistical Physics | 7.5 hp | First cycle

### Supplementary information

Based on the school year plan for 2015/2016. Changes can be made for the coming academic year.

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 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: EI1222, EP1100, SF1546, SF1628, SF1662, SF1861, SH1012, DD1320, IH1611, DD1388.

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)**

<table>
<thead>
<tr>
<th>Course code</th>
<th>Course name</th>
<th>Credits</th>
<th>Edu. level</th>
</tr>
</thead>
<tbody>
<tr>
<td>EF112X</td>
<td>Degree Project in Electrical Engineering, First Cycle</td>
<td>15.0 hp</td>
<td>First cycle</td>
</tr>
<tr>
<td></td>
<td>Replaces EF111X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EH110</td>
<td>Global Impact of Electrical Engineering</td>
<td>7.5 hp</td>
<td>First cycle</td>
</tr>
<tr>
<td>EJ1200</td>
<td>Electric Power Systems</td>
<td>6.0 hp</td>
<td>First cycle</td>
</tr>
<tr>
<td>EK1191</td>
<td>Measurement Technology</td>
<td>6.0 hp</td>
<td>First cycle</td>
</tr>
<tr>
<td>EL1000</td>
<td>Automatic Control, General Course</td>
<td>6.0 hp</td>
<td>First cycle</td>
</tr>
<tr>
<td>EQ1270</td>
<td>Stochastic Signals and Systems</td>
<td>6.0 hp</td>
<td>First cycle</td>
</tr>
<tr>
<td>IE1207</td>
<td>Analog Electronics</td>
<td>6.0 hp</td>
<td>First cycle</td>
</tr>
</tbody>
</table>

**Conditionally elective courses**

<table>
<thead>
<tr>
<th>Course code</th>
<th>Course name</th>
<th>Credits</th>
<th>Edu. level</th>
</tr>
</thead>
<tbody>
<tr>
<td>DD1320</td>
<td>Applied Computer Science</td>
<td>6.0 hp</td>
<td>First cycle</td>
</tr>
<tr>
<td>DD1388</td>
<td>Program System Construction Using C++</td>
<td>7.5 hp</td>
<td>First cycle</td>
</tr>
<tr>
<td>EI1222</td>
<td>Electromagnetic Theory, Continuation Course</td>
<td>6.0 hp</td>
<td>First cycle</td>
</tr>
<tr>
<td>EP1100</td>
<td>Data Communications and Computer Networks</td>
<td>7.5 hp</td>
<td>First cycle</td>
</tr>
<tr>
<td>IH1611</td>
<td>Semiconductor Devices</td>
<td>7.5 hp</td>
<td>First cycle</td>
</tr>
<tr>
<td>SF1547</td>
<td>Numerical Methods, Basic Course</td>
<td>6.0 hp</td>
<td>First cycle</td>
</tr>
<tr>
<td>SF1662</td>
<td>Discrete Mathematics</td>
<td>7.5 hp</td>
<td>First cycle</td>
</tr>
<tr>
<td>SF1691</td>
<td>Complex Analysis</td>
<td>7.5 hp</td>
<td>First cycle</td>
</tr>
<tr>
<td></td>
<td>replaces SF1628</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SH1012</td>
<td>Modern Physics</td>
<td>8.0 hp</td>
<td>First cycle</td>
</tr>
<tr>
<td>SK1119</td>
<td>Thermodynamics and Statistical Physics</td>
<td>7.5 hp</td>
<td>First cycle</td>
</tr>
</tbody>
</table>
Appendix 2: Specialisations

Degree Programme in Electrical Engineering (CELTE), Programme syllabus for studies starting in autumn 2016

This programme has no specialisations.