Programme syllabus

Degree Programme in Electrical Engineering
Civilingenjörsutbildning i elektroteknik

300.0 credits

Valid for students admitted to the education from autumn 11 (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

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**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 KTH's 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

- Computational and Systems Biologi
- Electrophysics
- Electric Power Engineering
- Photonics
- Embedded Systems
- Medical Engineering
- Nano Technology
- Network Services and Systems
- Systems, control and robotics
- System-on-Chip Design
- Wireless Systems
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

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.

**Leave of Study**

*Leave of Study* means that the student does not participate in courses during at least one term. Approved leave of study gives the student the right to return to the studies at a given point in time. During the leave of study, the student is able to complete courses and participate in exams in unfinished courses.

The application for leave of studies is submitted to the EES student office, which approves or denies the application. When the student intends to return to the studies, a new application must be submitted.

**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:


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 2011

**General courses**

**Year 1**

**Mandatory courses (60.0 credits)**

<table>
<thead>
<tr>
<th>Course code</th>
<th>Course name</th>
<th>Credits</th>
<th>Edu. level</th>
</tr>
</thead>
<tbody>
<tr>
<td>DD1343</td>
<td>Computer Science and Numerical Methods, part 1</td>
<td>7.5</td>
<td>First cycle</td>
</tr>
<tr>
<td>EH1010</td>
<td>Project Course in Electrical Engineering</td>
<td>7.5</td>
<td>First cycle</td>
</tr>
<tr>
<td>EI1110</td>
<td>Electrical Circuit Analysis, Extended Course</td>
<td>9.0</td>
<td>First cycle</td>
</tr>
<tr>
<td>IE1205</td>
<td>Digital Design</td>
<td>6.0</td>
<td>First cycle</td>
</tr>
<tr>
<td>SF1624</td>
<td>Algebra and Geometry</td>
<td>7.5</td>
<td>First cycle</td>
</tr>
<tr>
<td>SF1625</td>
<td>Calculus in One Variable</td>
<td>7.5</td>
<td>First cycle</td>
</tr>
<tr>
<td>SF1626</td>
<td>Calculus in Several Variable</td>
<td>7.5</td>
<td>First cycle</td>
</tr>
<tr>
<td>SF1649</td>
<td>Vector Analysis and Complex Functions</td>
<td>7.5</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>EL1150</td>
<td>Introductory Matlab Course</td>
<td>1.5</td>
<td>First cycle</td>
</tr>
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</table>

**Year 2**

**Mandatory courses (60.0 credits)**

<table>
<thead>
<tr>
<th>Course code</th>
<th>Course name</th>
<th>Credits</th>
<th>Edu. level</th>
</tr>
</thead>
<tbody>
<tr>
<td>DN1243</td>
<td>Computer Science and Numerical Methods, Part 2</td>
<td>7.5</td>
<td>First cycle</td>
</tr>
<tr>
<td>EH1020</td>
<td>Project Course in Electrical Engineering, part II</td>
<td>4.5</td>
<td>First cycle</td>
</tr>
<tr>
<td>EI1200</td>
<td>Electromagnetic Field Theory</td>
<td>7.5</td>
<td>First cycle</td>
</tr>
<tr>
<td>Course code</td>
<td>Course name</td>
<td>Credits</td>
<td>Edu. level</td>
</tr>
<tr>
<td>-------------</td>
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</tr>
<tr>
<td>EI1210</td>
<td>Wave Propagation and Antennas</td>
<td>7.5</td>
<td>First cycle</td>
</tr>
<tr>
<td>EQ1100</td>
<td>Signals and Systems, part II</td>
<td>7.5</td>
<td>First cycle</td>
</tr>
<tr>
<td>IF1601</td>
<td>Physics part 1, Thermodynamics and Wave Physics</td>
<td>6.0</td>
<td>First cycle</td>
</tr>
<tr>
<td>SF1635</td>
<td>Signals and Systems, part I</td>
<td>7.5</td>
<td>First cycle</td>
</tr>
<tr>
<td>SF1901</td>
<td>Probability Theory and Statistics</td>
<td>6.0</td>
<td>First cycle</td>
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<tr>
<td>SG1102</td>
<td>Mechanics, Smaller Course</td>
<td>6.0</td>
<td>First cycle</td>
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**Year 3**

**Mandatory courses (204.0 credits)**

<table>
<thead>
<tr>
<th>Course code</th>
<th>Course name</th>
<th>Credits</th>
<th>Edu. level</th>
</tr>
</thead>
<tbody>
<tr>
<td>ED111X</td>
<td>Degree Project in Electrical Engineering, First Cycle</td>
<td>15.0</td>
<td>First cycle</td>
</tr>
<tr>
<td>EF111X</td>
<td>Degree Project in Electrical Engineering, First Cycle</td>
<td>15.0</td>
<td>First cycle</td>
</tr>
<tr>
<td>EG111X</td>
<td>Degree Project in Electrical Engineering, First Cycle</td>
<td>15.0</td>
<td>First cycle</td>
</tr>
<tr>
<td>EH111X</td>
<td>Degree Project in Electrical Engineering, First Cycle</td>
<td>15.0</td>
<td>First cycle</td>
</tr>
<tr>
<td>EI111X</td>
<td>Degree Project in Electrical Engineering, First Cycle</td>
<td>15.0</td>
<td>First cycle</td>
</tr>
<tr>
<td>EJ111X</td>
<td>Degree Project in Electrical Engineering, First Cycle</td>
<td>15.0</td>
<td>First cycle</td>
</tr>
<tr>
<td>EJ1200</td>
<td>Electric Power Systems</td>
<td>6.0</td>
<td>First cycle</td>
</tr>
<tr>
<td>EK111X</td>
<td>Degree Project in Electrical Engineering, First Cycle</td>
<td>15.0</td>
<td>First cycle</td>
</tr>
<tr>
<td>EK1190</td>
<td>Measurement Technology</td>
<td>7.5</td>
<td>First cycle</td>
</tr>
<tr>
<td>EL1110</td>
<td>Automatic Control, General Course</td>
<td>6.0</td>
<td>First cycle</td>
</tr>
<tr>
<td>EL111X</td>
<td>Degree Project in Electrical Engineering, First Cycle</td>
<td>15.0</td>
<td>First cycle</td>
</tr>
<tr>
<td>EN111X</td>
<td>Degree Project in Electrical Engineering, First Cycle</td>
<td>15.0</td>
<td>First cycle</td>
</tr>
<tr>
<td>EP111X</td>
<td>Degree Project in Electrical Engineering, First Cycle</td>
<td>15.0</td>
<td>First cycle</td>
</tr>
<tr>
<td>EQ111X</td>
<td>Degree Project in Electrical Engineering, First Cycle</td>
<td>15.0</td>
<td>First cycle</td>
</tr>
<tr>
<td>EQ1260</td>
<td>Signal Processing</td>
<td>6.0</td>
<td>First cycle</td>
</tr>
<tr>
<td>IE1202</td>
<td>Analog Electronics</td>
<td>7.5</td>
<td>First cycle</td>
</tr>
<tr>
<td>IF1602</td>
<td>Physics part 2, Material Physics</td>
<td>6.0</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>
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<tr>
<td>DD1347</td>
<td>Computer Science Project</td>
<td>3.0</td>
<td>First cycle</td>
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<tr>
<td>Course code</td>
<td>Course name</td>
<td>Credits</td>
<td>Edu. level</td>
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</tr>
<tr>
<td>EP1100</td>
<td>Data Communications and Computer Networks</td>
<td>7.5</td>
<td>First cycle</td>
</tr>
<tr>
<td>IS1200</td>
<td>Computer Hardware Engineering</td>
<td>7.5</td>
<td>First cycle</td>
</tr>
<tr>
<td>ME1003</td>
<td>Industrial Management, Basic Course</td>
<td>6.0</td>
<td>First cycle</td>
</tr>
<tr>
<td>MJ2613</td>
<td>Sustainable Development</td>
<td>6.0</td>
<td>Second cycle</td>
</tr>
<tr>
<td>SF1861</td>
<td>Optimization</td>
<td>6.0</td>
<td>First cycle</td>
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</table>
Master, Computational and Systems Biology (BSB)

Year 1
Year 2
Year 3
Year 4
Year 5

Master, Embedded Systems (EBS)

Year 1
Year 2
Year 3
Year 4
Year 5

Master, Electrophysics (ELF)

Year 1
Year 2
Year 3
Year 4
Year 5

Master, Electrical Power Engineering (ELP)

Year 1
Year 2
Year 3
Year 4
Year 5

Master, Medical Engineering (MEG)

Year 1
<table>
<thead>
<tr>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Master, Network Services and Systems (NSS)</strong></td>
<td><strong>Master, Nanotechnology (NTE)</strong></td>
<td><strong>Master, Photonics (PHS)</strong></td>
<td><strong>Master, Systems, Control and Robotics (SCR)</strong></td>
</tr>
<tr>
<td>Year 1</td>
<td>Year 2</td>
<td>Year 3</td>
<td>Year 4</td>
</tr>
</tbody>
</table>
Master, System-on-Chip Design (SKK)

Year 1
Year 2
Year 3
Year 4
Year 5

Master, Wireless Systems (TLS)

Year 1
Year 2
Year 3
Year 4
Year 5
Appendix 2: Specialisations

Degree Programme in Electrical Engineering (CELTE), Programme syllabus for studies starting in autumn 2011

**Master, Computational and Systems Biology (BSB)**
See
http://www.kth.se/student/kurser/program/TBSBM

**Master, Embedded Systems (EBS)**
See
http://www.kth.se/student/kurser/program/TEBSM?l=en

**Master, Electrophysics (ELF)**
See
http://www.kth.se/studies/programmes/master/programmes/ee/electrophysics?l=en_UK
http://www.kth.se/student/kurser/program/telfm/?l=en_UK

**Master, Electrical Power Engineering (ELP)**
See
http://www.kth.se/en/studies/programmes/master/programmes/ee/electric-power
http://www.kth.se/student/kurser/program/TELPM?l=en

**Master, Medical Engineering (MEG)**
See
http://www.kth.se/student/kurser/program/TMLEM?l=en

**Master, Network Services and Systems (NSS)**
See
http://www.kth.se/student/kurser/program/TNSSM?l=en
Master, Nanotechnology (NTE)
See
http://www.kth.se/en/studies/programmes/master/programmes/mse/nanotechnology
http://www.kth.se/student/kurser/program/TNTEM?l=en

Master, Photonics (PHS)
See
http://www.kth.se/student/kurser/program/TPHSM?l=en

Master, Systems, Control and Robotics (SCR)
See
http://www.kth.se/student/kurser/program/TSCRM?l=en

Master, System-on-Chip Design (SKK)
See
http://www.kth.se/student/kurser/program/TSKKM?l=en

Master, Wireless Systems (TLS)
See
http://www.kth.se/student/kurser/program/TTLSM?l=en