



# Programme syllabus

[An accessible version of the syllabus can be found in the Course and programme directory.](#)

## Degree Programme in Electrical Engineering 180 credits

Högskoleingenjörsutbildning i elektroteknik, Flemingsberg

*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

Electrical Engineering is a subject which deals with electricity as a means of sending signals and information or as a conductor of energy. This relates to e.g., mobile communication, electrical and data networks in homes or electrical machines. Electrical Engineering is crucial to the future development of industry, to an eco-friendly and sustainable society and to our day-to-day lives.

Electrical Engineering 180 credits is an engineering programme with emphasis on applied technology. Technical application in the form of practical sessions, projects and larger, independent assignments are important parts of the teaching method which characterizes the programme. The objective is to train engineers with sound, independent ability to utilize and develop advanced technology.

The programme's objective is to prepare students for a professional role as a Bachelor of Science in Engineering, operating within the area of applied Electrical Engineering with specializations in electronics and inbuilt systems, data and telecommunications and electrical power.

The Bachelor of Science (engineering) graduate shall be able to work within a broad range of activities, such as managing projects, construction, product development, operation and maintenance, marketing and sales, both independently and in a project team.

The Bachelor of Science programme will also provide a sound base for further education at a higher level, a guaranteed lifetime of continued learning and personal development within both the individual's specialization and new subject areas.

## Knowledge and understanding

A Bachelor of Science graduate from the programme Electrical Engineering 180 credits shall

- have knowledge of the scientific base of Electrical Engineering as well as solid experience and awareness of current development and research
- have a broad proficiency in electrical engineering and in-depth knowledge of the chosen specialization
- have knowledge electrical engineering problems in the scope of a system, with emphasis on applied technology
- understand the role of the engineer
- have knowledge of social, environmental, cultural and business aspects and the effects that electronic systems have on these

## Skills and abilities

A Bachelor of Science from the programme Electrical Engineering 180 credits will

- be able to apply knowledge of Electrical Engineering to solve electronic problems in product development, manufacturing, and operation and maintenance
- be able to apply mathematics and science, as well as use the appropriate tools, in Electrical Engineering
- be able to use a creative and critical work-ethic to identify, formulate and solve problems in the field of Electrical Engineering with the appropriate methods and tools
- to be able to work independently and within the specific framework of engineering projects in the field of Electrical Engineering
- show the ability to work cooperatively, organise, and be a project leader
- show sound communication ability, both verbally and in writing, in English and Swedish, in the context of engineering

## Ability to make judgements and adopt a standpoint

A Bachelor of Science graduate from the programme Electrical Engineering 180 credits shall

- show ability and insight in the importance of teamwork and cooperation in multidisciplinary and culturally diverse project groups
- show understanding of and respect for the impact that Electrical Engineering has on people, society and the environment
- be able to evaluate Electrically Engineered systems, not only from a technical aspect but also from ethical, cultural and economic aspects

Information with regard to the degree requirements for the Bachelor of Science in Engineering degree are presented in KTH's Degree ordinance:

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

## Extent and content of the programme

The nominal study period is 3 years, which is equivalent to 180 credits. The programme is at undergraduate level.

The programme provides a broad technical base with possibilities of specialization and optional elements further in as well as further education at a higher level.

The joint courses within the first two years of study comprise the basics of electrical principles, electronics, telecommunications and computer networking. Basics of programming and mathematics - important tools for an engineer - are also taught in the first two years of study. The programme also contains courses which broaden technical knowledge with considerations such as economy and organisation, environmental and labour sciences, and engineering fundamentals, in preparation for a professional role as an engineer.

During the third year, one of three specializations is chosen:

- Embedded systems
- Telecommunications and computer networking
- Electrical Power

The programme is conducted primarily in Swedish. Further into the programme, certain subjects are in English, and some English course literature will be used.

## Eligibility and selection

For admission to the degree programme, general entry requirements are necessary, as well as special eligibility in the following: Mathematics course D, Physics course B, Chemistry course A. A pass grade or higher must have been achieved in each of these courses.

Two thirds of the places available are allocated based on students' grades in previous studies. The remaining third are allocated based on test results.

For study programme prerequisites and information on the selection process, see KTH's admission regulations:

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

# Implementation of the education

## Structure of the education

The academic year is typically divided into 4 periods of study, usually entailing the simultaneous study of two courses in each period.

The tutelage and examination format vary from course to course. The programme commonly contains a number of lectures, which provide an introduction to conceptions and theories. Practical exercises and lab sessions strengthen understanding of the theoretical connections.

Project work in line with a realistic economic model plays an essential role in the study programme. This is an exercise in applying engineering skills and knowledge in group work, where the tasks relate to real-world activity.

The study programme comprises non-optional courses during the first two years. To maintain a sense of coherence within the study programme, emphasis is placed on coordination between courses and continuity from one academic year to the next. During the third year, the student chooses alternative courses within the programme; it is possible to choose courses to a value of 15 credits, provided that these are relevant to the study programme.

At the end of the study programme, the student will undertake a degree project. This is often carried out with an employer; outside of the University.

For detailed information of the timetable for the academic year, visit the Student web:

<http://www.kth.se/student/schema/1.1007>

During the study programme, the opportunity is given to participate in optional courses carrying a value of around 15 credits, provided that these are relevant to the programme.

### **Specializations**

During the third year of study, one of three different specializations is chosen.

- Embedded Systems

- Telecommunications and Computer Networking
- Electrical Power

The specialization *Embedded Systems and Electronics* comprises non-optional courses in Embedded Systems and Real-time Systems, and optional courses in areas such as Signals and Systems, Wireless Networking and Mobile Communication, Control Systems and Wireless Sensor Systems.

The specialization *Telecommunication and Computer Networking* comprises non-optional courses in Communication Systems, and Wireless Networking and Mobile Communication, as well as optional courses in Network Security, Routing in IP Networks , Development of Web-based Services, Wireless Sensor Systems, Queueing Theory and Programming of Mobile Services.

The specialization *Electrical Power* comprises non-optional courses in Power Systems and Civil Engineering, as well as optional courses in Control Systems, Power Electronics, Electrical Drives, Power Systems and Wind Power Systems.

## 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

### Study application/ term registration

Students shall apply via "Mina sidor" (personalised webpage) : between 1–15 November if applying for the Spring term and between 1–15 May if applying for the Autumn term. The study application is the basis for term registration; with it you may register for courses, obtain results and apply for study aid through CSN.

### Choice of courses

Leading up to the Autumn and Spring terms in the 3rd year of study, the student shall choose courses under the specializations which the programme offers.

### Begin a higher year of study

For studies in the second year of the programme, a minimum of 37.5 credits from year one of the programme of study is required in order to be enrolled in year two. If a student does not fulfil these

requirements he/she needs to fill in an individual study plan, following consultation with the Study Advisor.

For studies in the third year of the programme, a minimum of 90 credits from years one and two of the programme of study is required in order to be enrolled in year three. If a student does not fulfil these requirements he/she needs to fill in an individual study plan, following consultation with the Study Advisor

Students who do not qualify for promotion to the next year must contact the Study Advisor.

### **Course registration**

Every student shall, at the first scheduled lecture or class, sign a course register. If a student registers for a course and later decides not to complete it, they must inform the course tutor or study programme administrator of this as soon as possible.

It is the student's responsibility to ensure that required competencies from previous courses are achieved before starting the next. Information on required competencies can be found in the respective syllabus, in the "Kurs- och programkalalogen" (Course and programme catalogue) on the Student web: <http://www.kth.se/student/kurser/>

## **Recognition of previous academic studies**

Students have the right to transfer credits from other colleges/universities within Sweden or which are based abroad. The course/ courses must however be of such nature that they are relevant to the study programme. Credit transfer of a whole course must be approved by the Director of Undergraduate and Masters' studies. Approval of credit transfer for part of a course can be given by an examiner.

Further information about credit transfers can be found at the KTH Intranet.

## **Studies abroad**

Students of the School of Technology and Health (STH) have the possibility to take one year of study abroad, at one of the institutions with which KTH collaborates, without having to pay the tuition fees which are ordinarily incurred for studies abroad. Studies can be taken abroad in the third year of the programme. It is also possible to do the Bachelor's Degree Project abroad.

Information on studies abroad is given by the international coordinators at the student office who can also provide information on application periods. Studies abroad can, following assessment, be approved as part of the Bachelor of Science in Engineering programme. The student travelling abroad shall establish a Learning Agreement with the university which implies prior permission for studies abroad. The courses are typically delivered in the language of the country/ region in which you are studying. For students accepted on to exchange programmes in German, French, Spanish and Italian speaking countries, preparatory language courses are available before the usual start of term.

# Degree project

Part of the programme entails a degree project carrying a value of 15 credits. This equates to around 10 weeks of full-time studies. See also: " Riktlinjer för examensarbeten " (Guidelines for degree projects), School of Technology and Health.

The degree project:

- May only be undertaken once 120 credits are obtained and final grades are achieved in relevant courses which affect the content of the degree project.
- May be undertaken once the assignment has been approved by the examiner.
- Is based on knowledge gained during studies and shall normally be undertaken during term 6.
- Shall constitute proof of independent work comprising theoretical and/ or experimental elements with accompanying written report and verbal presentation.
- The instructor is chosen by the examiner.

Further information about KTH's common goals for Bachelors of Science (engineering) can be found at:

<http://intra.kth.se/regelverk/utbildning-forskning/grundutbildning/examensarbete/1.27210>

# Degree

To take the Bachelor of Science in Engineering, Degree programme in Electrical Engineering, the student must have passed all of the courses in his or her syllabus. The Syllabus is comprised of the non-optional courses, the optional courses that the student has elected to undertake, and the degree project. The syllabus shall contain at least 180 credits.

Courses which, content-wise, overlap other courses in the programme may not be counted towards the 180 higher education credits which comprise the degree

Further information about the degree can be found at:

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

To receive the degree, the student must apply for a degree certificate by completing the appropriate form. Further information can be found on the Student web.

Appendix 1 - Course list

Appendix 2 - Programme syllabus descriptions



# Appendix 1: Course list

## Degree Programme in Electrical Engineering (TIELA)

### General courses

Year 1

#### Mandatory courses (60.0 Credits)

Code	Name	Credits	Edu. level
<a href="#">HE1026</a>	Digital Electronics	6.0 hp	First cycle
<a href="#">HE1027</a>	Electrical Principals	7.0 hp	First cycle
<a href="#">HE1028</a>	Computer Engineering	8.0 hp	First cycle
<a href="#">HE1029</a>	Electrical Engineering and Internet Technology, Project Course	9.0 hp	First cycle
<a href="#">HF1005</a>	Engineering and Information Skills	6.0 hp	First cycle
<a href="#">HF1008</a>	Linear Algebra and Calculus in One Variable	10.0 hp	First cycle
<a href="#">HF1201</a>	Sustainability and Ergonomics	6.0 hp	First cycle
<a href="#">HI1024</a>	Computer Programming, Basic Course	8.0 hp	First cycle

#### Optional courses

Code	Name	Credits	Edu. level
<a href="#">HF0009</a>	Introduction to Mathematics	1.5 fup	Pre-university level
<a href="#">HF0010</a>	Introduction to Computer Studies	1.5 fup	Pre-university level



## Year 2

### Mandatory courses (60.0 Credits)

Code	Name	Credits	Edu. level
<a href="#">HE1030</a>	Analog Electronics	8.0 hp	First cycle
<a href="#">HE1031</a>	Economics and Organizational Theory	7.0 hp	First cycle
<a href="#">HE1032</a>	Electric Power Engineering I	8.0 hp	First cycle
<a href="#">HE1033</a>	Communication Networks	7.0 hp	First cycle
<a href="#">HE1034</a>	Telecommunication	7.0 hp	First cycle
<a href="#">HE1035</a>	Project Course in Electrical Engineering	9.0 hp	First cycle
<a href="#">HF1011</a>	Signals, Systems and Transforms	8.0 hp	First cycle
<a href="#">HF1012</a>	Mathematical Statistics	6.0 hp	First cycle

## Year 3

### Mandatory courses (15.0 Credits)

Code	Name	Credits	Edu. level
<a href="#">HE111X</a>	Degree Project in Electrical Engineering, First Cycle	15.0 hp	First cycle

## Conditionally elective courses

Code	Name	Credits	Edu. level
<a href="#">AH2029</a>	Railway Signalling System	7.5 hp	Second cycle
<a href="#">AH2031</a>	Railway Signalling System - Project Planning	7.5 hp	Second cycle
<a href="#">EG2340</a>	Wind Power Systems	7.5 hp	Second cycle
<a href="#">EH2720</a>	Management of Projects	7.5 hp	Second cycle
<a href="#">EH2741</a>	Communication and Control in Electric Power Systems	6.0 hp	Second cycle
<a href="#">EI2435</a>	Power Grid Technology and Components	7.5 hp	Second cycle
<a href="#">HE1036</a>	Electric Power Engineering II	7.5 hp	First cycle
<a href="#">HE1038</a>	Control Engineering	7.5 hp	First cycle
<a href="#">HI1023</a>	Network Security	7.5 hp	First cycle
<a href="#">HI1027</a>	Object Oriented Programming	8.0 hp	First cycle
<a href="#">HI1032</a>	Communication Systems	7.5 hp	First cycle
<a href="#">HI1033</a>	Mobile Applications and Wireless Networks	7.5 hp	First cycle
<a href="#">HI1035</a>	Mobile Communications and Wireless Networks	7.5 hp	First cycle
<a href="#">HI1037</a>	Internet's Domain Name System	7.5 hp	First cycle
<a href="#">HI2002</a>	Routing in IP Networks	7.5 hp	Second cycle
<a href="#">II2302</a>	Sensor Based Systems	7.5 hp	Second cycle
<a href="#">IL1331</a>	VHDL Design	7.5 hp	First cycle
<a href="#">IL2219</a>	Radio Electronics	7.5 hp	Second cycle
<a href="#">IL2225</a>	Embedded Hardware Design in ASIC and FPGA	7.5 hp	Second cycle
<a href="#">IS1300</a>	Embedded Systems	7.5 hp	First cycle
<a href="#">ME2083</a>	Hydropower- Technology, Economy, Sustainability	7.5 hp	Second cycle

## Supplementary information

There are two selectable tracks:

For the track "Embedded systems and Computer Networks" the courses HI1035 Mobile Communications and Wireless Networks and IS1300 Embedded Systems are mandatory.

For the track "Electric Power Systems" the courses HE1036 Electric Power Engineering II and EI2435 Power Grid Technology and Components are mandatory.

The information is based on the curriculum for academic year 2015/16 and changes may occur.



# Appendix 2: Specialisations

## Degree Programme in Electrical Engineering (TIELA)

This programme has no specialisations.