Programme syllabus

Degree Programme in Computer Engineering
Högskoleingenjörsutbildning i datateknik, Flemingsberg
180.0 credits

Valid for students admitted to the education from autumn 15 (HT - Autumn term; VT - Spring term).

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

Programme objectives

Information Technology has profoundly changed society and our lives. Competence in computer and communication technologies is just as crucial to the growth of industry as well as to our day-to-day lives; everything from multimedia and online entertainment, mobile communication, internet search engines for web-based trade and large Electronic Medical Records systems for the Health Care sector. The programme places emphasis on applied Information Technology with lab sessions, projects and individual assignments; these elements will form important parts of the programme. The goal is to train engineers with the ability to use and develop advanced technology, both independently and in a project team.

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 Computer Engineering with optional specializations in Computer Technology, Software and Systems Development, Computer Networks and Software development for Technical Systems.

The graduating Bachelor of Science shall be able to engage in a broad range of activities, such as project management, software development, network administration, 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 from the programme Computer Engineering 180 credits shall

• have knowledge of Information Technology's scientific base as well as solid experience and awareness of current development and research
• have a broad proficiency in computer and communication technologies and in-depth knowledge of the chosen specialization
• have knowledge of Computer Engineering and Data Communication from a system perspective, with emphasis on applied technology,
• understand the role of the engineer
• have knowledge of social, environmental, cultural and business aspects and the effects that information and communication systems have on these

Skills and abilities

A Bachelor of Science in Engineering from the programme Computer Engineering 180 credits shall

• be able to apply knowledge of Information Technology to solve technical problems
- be able to apply knowledge of programming and Communication Technology for the development, operation and maintenance of hardware, network administration and internet-based services
- be able to apply mathematics and science within Information Technology
- be able to use a creative and critical work-ethic to identify, formulate and solve problems in the field of Computer Engineering with the appropriate methods and tools
- be able to work independently and within the specific framework of engineering projects in the field of Computer Technology
- 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 in Engineering from the programme Computer 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 Information Technology has on people, society and the environment
- be able to evaluate IT 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. The first two years of study concentrate on the basics of programming, digital and microcomputer technologies, communication networks and database engineering, as well as algorithms and data structures. Mathematics, an important tool for an Information Technology engineer, is studied in a number of courses. The programme also contains courses which broaden technical knowledge with considerations such as economy and organisation, environmental and labour sciences and engineering fundamentals.

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

- Software and System Development
- Computer Networking and Internet Services
- Software Development for Technical Systems

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:
Implementation of the education

Structure of the education

The courses in the programme are ranked in accordance with a seven grade scale; A–E, F and FX.

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 they are relevant to the programme.

Specializations

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

• Software and System Development

• Computer Networking and Internet Services

• Software Development for Technical Systems

The final year of the programme comprises two non-optional courses, optional courses under three different specializations and one degree project.

• Non-optional courses (15 credits) including Web-based Information Systems and Communication Systems.

• Optional courses (30 credits) under three different specializations (see below). It is also possible to combine courses from the three different specializations.

• Degree project (15 credits)

The specialization Software and System Development is primarily concerned with methods for developing business-critical systems for the internet, for example, advanced web systems for e-commerce or Electronic Medical Records systems in the Health Care sector. Development of client software, with web interface or for pocket computers and mobile phones, is also covered. The courses cover server-based systems, software engineering, interaction design, mobile applications etc.
The specialization *Computer Networking and Internet Services* concerns network administration and design, network security and development of systems and services for web-based communication. Practical application of network technology, which is included in the first years of study, is continued in the 3rd year. The optional courses cover network security, wireless communication etc.

The specialization *Software development for technical systems* concerns program development for technical systems with real-time requirements, e.g., small embedded systems with wireless communication. The courses cover real-time systems, programs and operating systems for mobile telephones and other portable appliances, wireless sensor networks etc.

**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**

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:

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

**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 Master’s thesis 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 Computer 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

In order to receive the degree, the student must apply for it on a special form. KTH’s local regulations can be found here: http://intra.kth.se/regelverk/utbildning-forskning/grundutbildning/examina/lokala-foreskrifter-for-examina-pa-grundniva-och-avancerad-niva-lokal-examensordning-1.27227\?l=en_UK

*Appendix 1 - Course list
Appendix 2 - Programme syllabus descriptions*
Appendix 1: Course list

Degree Programme in Computer Engineering (TIDAA), Programme syllabus for studies starting in autumn 2015

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>HE1026</td>
<td>Digital Electronics</td>
<td>6.0</td>
<td>First cycle</td>
</tr>
<tr>
<td>HE1028</td>
<td>Computer Engineering</td>
<td>8.0</td>
<td>First cycle</td>
</tr>
<tr>
<td>HF1005</td>
<td>Engineering and Information Skills</td>
<td>6.0</td>
<td>First cycle</td>
</tr>
<tr>
<td>HF1006</td>
<td>Linear Algebra and Calculus in One Variable</td>
<td>10.0</td>
<td>First cycle</td>
</tr>
<tr>
<td>HF1201</td>
<td>Sustainability and Ergonomics</td>
<td>6.0</td>
<td>First cycle</td>
</tr>
<tr>
<td>HI1024</td>
<td>Computer Programming, Basic Course</td>
<td>8.0</td>
<td>First cycle</td>
</tr>
<tr>
<td>HI1025</td>
<td>Operating Systems</td>
<td>7.0</td>
<td>First cycle</td>
</tr>
<tr>
<td>HI1026</td>
<td>Computer Engineering and Internet Technology, Project Course</td>
<td>9.0</td>
<td>First cycle</td>
</tr>
</tbody>
</table>

Optional courses

<table>
<thead>
<tr>
<th>Course code</th>
<th>Course name</th>
<th>Credits</th>
<th>Edu. level</th>
</tr>
</thead>
<tbody>
<tr>
<td>HF0009</td>
<td>Introduction to Mathematics</td>
<td>1.5</td>
<td>Pre-university level</td>
</tr>
<tr>
<td>HF0010</td>
<td>Introduction to Computer Studies</td>
<td>1.5</td>
<td>Pre-university level</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>HE1031</td>
<td>Economics and Organizational Theory</td>
<td>7.0</td>
<td>First cycle</td>
</tr>
<tr>
<td>HE1033</td>
<td>Communication Networks</td>
<td>7.0</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>
<td>------------------------------------------</td>
<td>---------</td>
<td>--------------</td>
</tr>
<tr>
<td>HF1012</td>
<td>Mathematical Statistics</td>
<td>6.0</td>
<td>First cycle</td>
</tr>
<tr>
<td>HF1013</td>
<td>Discrete Mathematics</td>
<td>8.0</td>
<td>First cycle</td>
</tr>
<tr>
<td>HI1027</td>
<td>Object Oriented Programming</td>
<td>8.0</td>
<td>First cycle</td>
</tr>
<tr>
<td>HI1028</td>
<td>Software Development, Project Course</td>
<td>9.0</td>
<td>First cycle</td>
</tr>
<tr>
<td>HI1029</td>
<td>Algorithms and Data Structures</td>
<td>8.0</td>
<td>First cycle</td>
</tr>
<tr>
<td>HI1030</td>
<td>Database Technology</td>
<td>7.0</td>
<td>First cycle</td>
</tr>
</tbody>
</table>

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

### Year 3

#### Mandatory courses (30.0 credits)

<table>
<thead>
<tr>
<th>Course code</th>
<th>Course name</th>
<th>Credits</th>
<th>Edu. level</th>
</tr>
</thead>
<tbody>
<tr>
<td>HI1031</td>
<td>Distributed Information Systems</td>
<td>7.5</td>
<td>First cycle</td>
</tr>
<tr>
<td>HI1032</td>
<td>Communication Systems</td>
<td>7.5</td>
<td>First cycle</td>
</tr>
<tr>
<td>HI111X</td>
<td>Degree Project in Computer Engineering, First Cycle</td>
<td>15.0</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>HI1023</td>
<td>Network Security</td>
<td>7.5</td>
<td>First cycle</td>
</tr>
<tr>
<td>HI1033</td>
<td>Mobile Applications and Wireless Networks</td>
<td>7.5</td>
<td>First cycle</td>
</tr>
<tr>
<td>HI1034</td>
<td>Server Software Development</td>
<td>7.5</td>
<td>First cycle</td>
</tr>
<tr>
<td>HI1036</td>
<td>Software Engineering, Project Course</td>
<td>7.5</td>
<td>First cycle</td>
</tr>
<tr>
<td>HI1037</td>
<td>Internet's Domain Name System</td>
<td>7.5</td>
<td>First cycle</td>
</tr>
<tr>
<td>HI2002</td>
<td>Routing in IP Networks</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>HI2011</td>
<td>Program Development in Functional and Object-oriented languages</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>IS1300</td>
<td>Embedded Systems</td>
<td>7.5</td>
<td>First cycle</td>
</tr>
</tbody>
</table>

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

### Year 4
Appendix 2: Specialisations

Degree Programme in Computer Engineering (TIDAA), Programme syllabus for studies starting in autumn 2015

This programme has no specialisations.