



# Programme syllabus

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

## Degree Programme in Information and Communication Technology 300 credits

Civilingenjörsutbildning i informationsteknik

*Valid for students admitted to the education from autumn 21 (HT - Autumn term; VT - Spring term).*

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

### Programme objectives

The students should during the first three years of the education obtain basic understanding and skills in the core areas of information and communication technology: mathematics, electronics, computer engineering, communication and software engineering. During the final two years of the education, knowledge and skills are deepened within an area corresponding to a master's education at KTH or an Erasmus Mundus programme where KTH participates.

## Knowledge and understanding

For the degree of Master of Science in Engineering from the programme Information and Communication Technology the student shall

- apply mathematics and basic natural sciences within information and communication technology
- analyse technical problems from a systems perspective with an overall view on technical systems and their life cycle from conceptualisation, design, implementation, production, operation, maintenance and decommissioning
- follow and benefit from the advancement of knowledge within the area of information and communication technology.

## Skills and abilities

For the degree of Master of Science in Engineering from the programme Information and Communication Technology the student shall

- within the area of information and communication technology, be able to apply creative and critical working methods to formulate and explore problems with modern methods and tools
- be able to analyse technical problems from a systems perspective with an overall view on technical systems and their life cycle, including conceptualisation, design, implementation, production, operation, maintenance and decommissioning
- be able to work with problem-solving that takes its starting point in demand and functionality, considering the needs of individual's using the product and the technology interplay in the society
- have skills of efficient oral and written communication, in Swedish and English, for different target groups, corresponding to what is required for an international career.

## Ability to make judgements and adopt a standpoint

For the degree of Master of Science in Engineering from the programme Information and Communication Technology the student shall

- be able to appreciate that engineering problems are complex, often not well-defined, and sometimes contradictory
- by practice and reflection have developed the ability to work efficient in groups of different compositions
- exhibit an awareness of the ethical aspects of research and development work
- independently analyse and adopt a standpoint on economical, societal, environment-related and ethical consequences of information and communication technology applications, and to design systems concerning this.

# Extent and content of the programme

The education comprises five years and 300 credits. The three first years are first-cycle studies and the final two years are second-cycle studies. First-cycle courses are mainly taught in Swedish, while second-cycle courses are mainly conducted in English.

The final two years the student takes a specialisation that usually corresponds to a master's programme. The available master's programmes can vary over time. Currently, the following master's programmes leads to fulfilment of the requirements for a degree of Master of Science in Engineering.

- Computer Science (TCSCM)
- ICT Innovation (TIVNM)
- Information and Network Engineering (TINNM)
- Embedded systems (TEBSM)
- Industrial Management (TINEM)\*
- Interactive Media Technology (TIMTM)
- Communication Systems (TCOMM)
- Machine Learning (TMAIM)
- Medical Engineering (TMLEM)
- Software Engineering of Distributed Systems (TSEDM)
- Systems, Control and Robotics (TSCRM)
- Cybersecurity (TCYSM)

Easmus Mundus programmes where KTH participates can, after approval from the programme director also constitute a specialisation. For Erasmus Mundus programmes there are no reserved /guaranteed seats. These programmes must be applied to in competition with other applicants.

Students may be qualified to follow also other master's programme within KTH. If a student wishes to follow a different master's programme than those listed above, consultation shall take place with programme director.

## **\*) Special conditions for TINEM**

Students following the master's programme in industrial management (TINEM) should take at least 30 credits of technology courses, primarily from the mandatory courses in one of the following master's programmes:

- Software engineering of distributed systems (TSEDM)
- Communication systems (TCOMM)
- Embedded systems (TEBSM)

Technology courses from other master's programmes can also be selected after consultation with programme director.

The selection of technology courses shall be approved by the programme directors for TINEM and CINTE before starting the courses. This is made by creating an individual study plan.

## Eligibility and selection

General admission requirements and the following special admission requirements must be fulfilled in order to be admitted: Mathematics 4, Physics 2 and Chemistry 1 or equivalent. In each of the subjects, applicants must have at least grade E.

The selection process is based on final school grades and test results at the Swedish Scholastic Aptitude Test. Two-thirds of the places are offered based on grade selection and one-third on the Swedish Scholastic Aptitude Test.

## Implementation of the education

### Structure of the education

Each academic year consists of two semesters which are 20 weeks each, and each semester is further divided into two study periods.

The first two years consists of compulsory and conditionally elective courses. These are scheduled so that primarily two courses are read and completed in each period. Year 3 has three compulsory courses, conditionally elective courses, and an advanced study project that can also be used as degree project for a Bachelor of Science degree.

The courses in year 1–3 should help the student to acquire a solid foundation of mathematics/natural sciences, basic technological sciences and professional skills. In year three, the choice of specialisation for the second cycle is made. The guiding principle for specialisations is to make use of KTH's master's programmes in the following way:

The courses of the master's programme are read in year 4 and 5. Pre-requisites for respective master's programmes should be met by taking the required courses in year 3. Any requirements on compulsory and elective courses for the master's programme also apply for students on the degree programme in information and communication technology.

Apart from a degree project, at least 60 credits should come from second-cycle courses from the master's programme within the field of information and communication technology.

# Courses

The programme is course-based. Lists of courses are included in appendix 1.

Courses are either compulsory, conditionally elective or elective. For year 1–3 there are two sets of conditionally elective courses; mathematics/natural science subjects (MatNat block) and courses within the framework of the engineering area (IT block). It is required to complete at least 15 credits of courses from “MatNat block” and 12 credits of courses from “IT block”.

The programme offers room for up to 27 credits of elective courses. It is recommended that the room for elective courses within the programme is used to study pre-requisite courses for the selected master's programme. Pre-requisite courses for the master's programmes are listed at the programme 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.

Grading scale is found in the course syllabus.

## Conditions for participation in the programme

Participation requires admission to courses within the programme and course registration.

For further studies, special admission requirements for the course are to be fulfilled. Special admission requirements are listed in the respective course syllabus.

In order to be eligible for second-cycle studies within the integrated Master of Science programmes at KTH, the student are required to complete 165 credits from year one through three. Of these, 110 credits must be from year 1 and 2. The bachelor thesis shall be completed before Master's level studies commence.

## Degree project

The degree project is the final part of the education. The project work may begin when special admission requirements for the course are fulfilled.

### **Special conditions for TINEM**

For students at the master's programme in industrial management (TINEM) the second-cycle degree project must qualify as a degree project both in industrial management and in information and

communication technology. The degree project shall be approved by the programme director for TINEM and for CINTE before starting.

## Degree

The degree is entitled “Civilingenjörsexamen” - Master of Science in Engineering. The text on the degree certificate states the educational programme, Information and Communication Technology, that has been completed by the student.

Appendix 1 - Course list

Appendix 2 - Programme syllabus descriptions



# Appendix 1: Course list

## Degree Programme in Information and Communication Technology (CINTE)

### General courses

#### Year 1

#### Mandatory courses (60.0 Credits)

Code	Name	Credits	Edu. level
<a href="#">ID1018</a>	Programming I	7.5 hp	First cycle
<a href="#">IE1204</a>	Digital Design	7.5 hp	First cycle
<a href="#">IE1206</a>	Embedded Electronics	7.5 hp	First cycle
<a href="#">II1306</a>	Introduction to IT	1.5 hp	First cycle
<a href="#">IS1200</a>	Computer Hardware Engineering	7.5 hp	First cycle
<a href="#">SF1610</a>	Discrete Mathematics	7.5 hp	First cycle
<a href="#">SF1624</a>	Algebra and Geometry	7.5 hp	First cycle
<a href="#">SF1625</a>	Calculus in One Variable	7.5 hp	First cycle
<a href="#">SF1689</a>	Basic Course in Mathematics	6.0 hp	First cycle

## Year 2

### Mandatory courses (24.0 Credits)

Code	Name	Credits	Edu. level
ID1021	Algorithms and Data Structures <i>Replaces ID1020</i>	7.5 hp	First cycle
II1305	Project in Information and Communication Technology	7.5 hp	First cycle
II1307	Active Career	1.5 hp	First cycle
IK1203	Networks and Communication	7.5 hp	First cycle

### Conditionally elective courses

Code	Name	Credits	Edu. level
DD1351	Logic for Computer Scientists	7.5 hp	First cycle
DD2350	Algorithms, Data Structures and Complexity	9.5 hp	Second cycle
ID1019	Programming II	7.5 hp	First cycle
ID1217	Concurrent Programming	7.5 hp	First cycle
IV1303	Modern Software Development	6.0 hp	First cycle
IV1351	Data Storage Paradigms	7.5 hp	First cycle
ME1003	Industrial Management, Basic Course	6.0 hp	First cycle
SF1546	Numerical Methods, Basic Course	6.0 hp	First cycle
SF1686	Calculus in Several Variable	7.5 hp	First cycle
SK1118	Electromagnetism and Waves	7.5 hp	First cycle

### Information regarding conditionally elective courses

For year 1-3 there are two sets of conditionally elective courses: “MatNat block” and “IT block”. For a degree it is required that at least 15 credits of courses from the “MatNat block” and 12 credits of courses from the “IT block” has been completed. During year 2 all conditionally elective courses for the programmes are offered:

**“MatNat block” year 1-3 (28,5 credits whereof at least 15 credits is required for a degree)**

- SF1626 Calculus in Several Variable 7,5 credits (read in year 2)



- SK1118 Electromagnetism and Waves 7,5 credits (read in year 2)
- DD1351 Logic for Computer Scientists 7,5 credits (read in year 2 or 3)
- SF1546 Numerical methods 6 credits (read in year 2 or 3)

**“IT block” year 1-3 (44 credits whereof at least 12 credits is required for a degree)**

- ID1019 Programming II 7,5 credits (read in year 2)
- ME1003 Industrial Management 6 credits (read in year 2)
- IV1303 Modern Software Development 6 credits (read in year 2)
- DD2350 Algorithms, data structures and complexity 9,5 credits (read in year 2 or 3)
- IV1351 Data storage paradigms 7,5 credits (read in year 2 or 3)
- ID1217 Concurrent programming 7,5 credits (read in year 2 or 3)

**Information regarding elective courses**

The programme offers room for up to 27 credits of elective courses. The amount of elective courses that can be taken during year 2 depends on the choice of conditionally elective courses. However, there is often room for one or two elective courses, mainly during the autumn semester. This space should primarily be utilised to read pre-requisite courses for the selected master's programme. The courses required for the various master's programmes are listed on the programme web.

## Year 3

### Mandatory courses (43.5 Credits)

Code	Name	Credits	Edu. level
<a href="#">AL1523</a>	Digitalisation and Innovation for Sustainable Development	7.5 hp	First cycle
<a href="#">IA150X</a>	Degree Project in Information and Communication Technology, First Cycle	15.0 hp	First cycle
<a href="#">ID1206</a>	Operating Systems	7.5 hp	First cycle
<a href="#">IV1013</a>	Introduction to Computer Security	7.5 hp	First cycle
<a href="#">SF1912</a>	Probability Theory and Statistics	6.0 hp	First cycle

## Conditionally elective courses

Code	Name	Credits	Edu. level
<a href="#">DD1351</a>	Logic for Computer Scientists	7.5 hp	First cycle
<a href="#">DD2350</a>	Algorithms, Data Structures and Complexity	9.5 hp	Second cycle
<a href="#">ID1217</a>	Concurrent Programming	7.5 hp	First cycle
<a href="#">IV1351</a>	Data Storage Paradigms	7.5 hp	First cycle
<a href="#">SF1546</a>	Numerical Methods, Basic Course <i>One of SF1546, SF1547 can be included in the degree</i>	6.0 hp	First cycle

## Recommended courses

Code	Name	Credits	Edu. level
<a href="#">DD2352</a>	Algorithms and Complexity	7.5 hp	Second cycle
<a href="#">DD2372</a>	Automata and Languages	6.0 hp	Second cycle
<a href="#">DD2401</a>	Neuroscience	7.5 hp	Second cycle
<a href="#">DH2642</a>	Interaction Programming and the Dynamic Web	7.5 hp	Second cycle
<a href="#">EL1000</a>	Automatic Control, General Course	6.0 hp	First cycle
<a href="#">EQ1110</a>	Continuous Time Signals and Systems	6.0 hp	First cycle
<a href="#">EQ1120</a>	Discrete Time Signals and Systems	6.0 hp	First cycle
<a href="#">IC1007</a>	Human-computer Interaction: Principles and Design	7.5 hp	First cycle
<a href="#">ID1212</a>	Network Programming	7.5 hp	First cycle
<a href="#">ID1214</a>	Artificial Intelligence and Applied Methods	7.5 hp	First cycle
<a href="#">ID2201</a>	Distributed Systems, Basic Course	7.5 hp	Second cycle
<a href="#">ID2202</a>	Compilers and Execution Environments	7.5 hp	Second cycle
<a href="#">ID2216</a>	Developing Mobile Applications	7.5 hp	Second cycle
<a href="#">IE1202</a>	Analog Electronics	7.5 hp	First cycle
<a href="#">IH1611</a>	Semiconductor Devices	7.5 hp	First cycle
<a href="#">II1307</a>	Active Career	1.5 hp	First cycle
<a href="#">IK1552</a>	Internetworking	7.5 hp	First cycle
<a href="#">IK2206</a>	Internet Security and Privacy	7.5 hp	Second cycle
<a href="#">IS2202</a>	Computer Systems Architecture	7.5 hp	Second cycle
<a href="#">IV1350</a>	Object Oriented Design	7.5 hp	First cycle
<a href="#">LS1415</a>	English for Academic Studies (online)	3.0 hp	First cycle
<a href="#">LS1600</a>	Intercultural Competence	4.5 hp	First cycle
<a href="#">ME2016</a>	Project Management: Leadership and Control	6.0 hp	Second cycle
<a href="#">ME2163</a>	Leading People and Organizations in Different Contexts	6.0 hp	Second cycle
<a href="#">SF1547</a>	Numerical Methods, Basic Course <i>En av SF1546, SF1547 får ingå i examen.</i>	6.0 hp	First cycle
<a href="#">SG1102</a>	Mechanics, Smaller Course	6.0 hp	First cycle
<a href="#">SH1011</a>	Modern Physics	7.5 hp	First cycle

# Information regarding conditionally elective courses

For year 1-3 there are two sets of conditionally elective courses: “MatNat block” and “IT block”. For a degree it is required that at least 15 credits of courses from the “MatNat block” and 12 credits of courses from the “IT block” has been completed.

## **“MatNat block” year 1-3 (28,5 credits whereof at least 15 credits is required for a degree)**

- SF1626 Calculus in Several Variable 7,5 credits (read in year 2)
- SK1118 Electromagnetism and Waves 7,5 credits (read in year 2)
- DD1351 Logic for Computer Scientists 7,5 credits (read in year 2 or 3)
- SF1546 Numerical methods 6 credits (read in year 2 or 3)

## **“IT block” year 1-3 (44 credits whereof at least 12 credits is required for a degree)**

- ID1019 Programming II 7,5 credits (read in year 2)
- ME1003 Industrial Management 6 credits (read in year 2)
- IV1303 Modern Software Development 6 credits (read in year 2)
- DD2350 Algorithms, data structures and complexity 9,5 credits (read in year 2 or 3)
- IV1351 Data storage paradigms 7,5 credits (read in year 2 or 3)
- ID1217 Concurrent programming 7,5 credits (read in year 2 or 3)

## **Information regarding elective courses**

The programme offers room for up to 27 credits of elective courses. The amount of elective courses that can be taken during year 3 depends on the choice of conditionally elective courses. However, there is often room for one or two elective courses, mainly during the autumn semester. This space should primarily be utilised to read pre-requisite courses for the selected master's programme. The courses required for the various master's programmes are listed on the programme web.

## Year 4

## Supplementary information

Year 4-5 are studied at a master's programme and the programme syllabus for the programme in question applies.

Currently, the following master's programmes are offered as specialisations:

- Computer Science (TCSCM)
- ICT Innovation (TIVNM)

- Information and Network Engineering (TINNM)
- Embedded systems (TEBSM)
- Industrial Management (TINEM)\*
- Interactive Media Technology (TIMTM)
- Communication Systems (TCOMM)
- Machine Learning (TMAIM)
- Medical Engineering (TMLEM)
- Software Engineering of Distributed Systems (TSEDM)
- Systems, Control and Robotics (TSCRM)

## Year 5

### Supplementary information

Year 4-5 are studied at a master's programme and the programme syllabus for the programme in question applies.

Currently, the following master's programmes are offered as specialisations:

- Computer Science (TCSCM)
- ICT Innovation (TIVNM)
- Information and Network Engineering (TINNM)
- Embedded systems (TEBSM)
- Industrial Management (TINEM)\*
- Interactive Media Technology (TIMTM)
- Communication Systems (TCOMM)
- Machine Learning (TMAIM)
- Medical Engineering (TMLEM)
- Software Engineering of Distributed Systems (TSEDM)
- Systems, Control and Robotics (TSCRM)



# Appendix 2: Specialisations

## Degree Programme in Information and Communication Technology (CINTE)

This programme has no specialisations.