



# Programme syllabus

Master's Programme, Software Engineering of Distributed Systems,  
120 credits

Masterprogram, programvaruteknik för distribuerade system  
*120.0 credits*

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*Valid for students admitted to the education from autumn 18 (HT - Autumn term; VT - Spring term).*

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

## Programme objectives

Development of computer networks and communication technology provides a new technological foundation for designing software systems. The systems become distributed, reconfigurable and adaptive and their components employ a high degree of autonomy. The set of devices where distributed software applications may operate ranges from workstations to Personal Digital Assistants (PDA). Distributed computer environments also assume that information sources and control can be decentralized over the network. All this makes the process of developing distributed software systems significantly more complex than for centralized systems.

New technological developments create a great demand from industry in engineers who are able to design software systems utilizing these developments. Our Master program is intended to be an educational response to such industrial demand.

The program emphasizes combination of fundamental principles of distributed computing with modern methods of software systems design.

The program gives the students state-of-the-art knowledge of the field and develops their practical skills in order to meet current industrial requirements as well as ability to adapt to new developments of tomorrow technology.

## Knowledge and understanding

Upon successful completion of the program the students shall

- know basic methods of modern software development and data analysis
- understand a variety of approaches to software development and discuss their applicability boundaries, benefits, restriction and complementarities
- know basic Distributed AI methods for solving problems with decentralized control

- know basic concepts and principles of distributed systems
- understand distributed algorithms and have orientation about distributed architectures and middleware
- identify and describe examples of sustainability aspects related to distributed software systems
- Have in-depth knowledge in the chosen area of specialization
- explain social, ethical and environmental aspects of sustainable development in the area of distributed software systems.

## **Skills and abilities**

Upon successful completion of the program the students are able to

- use modern software development and data analysis methods and techniques in practical system development
- apply distributed AI methods in providing solutions to inherently distributed problems and to problems where expertise is distributed
- design, implement and maintain distributed software systems for a wide range of applications including, systems for peer-to-peer and cloud computing, systems with services oriented architecture, big data systems and internet-based systems
- based on various definitions of sustainable development illustrate and point out perspectives where progress within distributed software systems can be relevant for sustainable development in society.

## **Ability to make judgements and adopt a standpoint**

The student shall

- show ability to make assessments taking into account relevant scientific, societal and ethic aspects as well as show awareness of ethical aspects of research and development work
- show insight into the possibilities and limitations of science, its role in society and the responsibility of humans for its use also from a sustainability perspective
- show ability to identify her/his need for additional knowledge and take responsibility for the development of his/her own knowledge
- show ability to compare and evaluate possibilities and limitations of distributed software systems in the society and how they are used from a sustainability perspective.

## **Extent and content of the programme**

The program is a two year, 120 hp education.

The programme is a second cycle education programme.

The instruction language is English in all courses.

## **Eligibility and selection**

### **1. Previous studies**

**A completed Bachelor's degree**, equivalent to a Swedish Bachelor's degree (180 hp), from a university recognized by government or accredited by other recognized organization. A Bachelor's degree in Science or Engineering is required for most programs (please see the relevant program description). Applicants admitted to longer technical study programs and who have completed courses equivalent to an amount of 180 hp, will be considered on a case-by-case basis.

## 2. Specific admission requirements

Bachelor's degree in computer science or equivalent degree. Courses with mathematics, information technology or computer science equivalent to at least 90 hp credits.

The specific requirements may be assessed as not fulfilled if;

- the degree awarding institution is not considered to meet acceptable quality standards by the authorities of the country in which the institution is located
- the degree does not qualify for admission to equivalent Master level in the country where the degree is awarded.

## 3. Language requirements

A good knowledge of written and spoken English, equivalent to Eng B. Applicants must provide proof of their proficiency in English. KTH accepts

- TOEFL paper based test, total of 575, 4.5 writing section
- TOEFL internet based test, total of 90, 20 writing section
- IELTS score of at least 6.5, no band lower than 5.5 (only academic training accepted)

English proficiency tests are waived for applicants with English as language of instruction (minimum 3 years of full-time higher education studies).

Knowledge of English may be taken into account in the selection process.

## 4. Selection process

Students who apply for more than one Master's program at KTH must place the program in order of preference. Students will only be accepted to one program, according to the priority stated on the application form. Multiple applications will not be accepted.

The selection process is based on the following selection criteria: University, previous studies (for instance GPA, grades in specific subjects and English), motivation for the studies (for instance letter of motivation, references, thesis proposal and relevant work experience). The evaluation scale is 1-75.

The specific requirements may be assessed as not fulfilled if

1. the degree awarding institution is not considered to meet acceptable quality standards by the authorities of the country in which the institution is located
2. the degree does not qualify for admission to equivalent Master level in the country where the degree is awarded

# Implementation of the education

## Structure of the education

The program is a two year program; each year consists of four periods.

- Period 1: September/October
- Period 2: November/December
- Period 3: January/February
- Period 4: March/April/May

Each course in the program is offered in a specific period. During the first year mostly compulsory courses are taught. Elective courses are mostly taught in second year followed by Master degree project.

## Courses

The programme is course-based. Lists of courses are included in [appendix 1](#).

60 credits must be obtained from the set of compulsory courses (this includes degree project), 30 credits must be obtained from the set of conditionally elective courses and 30 credits can be taken from elective courses.

The programme offers two specialization tracks: software track and data science track.

## 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

Participation requires admission to courses within the programme and course registration. Course registration is done via the personal menu at [www.kth.se](http://www.kth.se)

For students starting their education from the autumn semester 2018, previous promotion requirements have been replaced with special admission requirements to each course. Admission requirements are specified in the course syllabus.

Courses are chosen by the student prior to the term when they are taught.

## Recognition of previous academic studies

Reference to the policy that is in KTH's regulatory framework:

<https://intra.kth.se/styrning/regelverk/utbildning-pa-grund-och-avancerad-niva-1.660818>.

## Studies abroad

The courses should be followed at KTH, and the master's thesis may be performed at universities or companies abroad.

## **Degree project**

The degree project is the final part of the education and comprises 30 higher education credits. The project work may begin when special admission requirements for the course are fulfilled.

In the master thesis project the student shall demonstrate that he/she is able to solve a given design or research problem largely on his/her own with limited guidance from the supervising teacher. In particular the student shall plan how to address the task, assess the difficulties of the individual steps, be able to make a realistic schedule for the project, identify obstacles and problems and suggest changes of the original task or plan if deemed necessary.

The student shall demonstrate that he/she is able to find relevant, related work in the literature and to put his/her own work in perspective of other work. If the project includes the design of hardware or software, the student has to be able to demonstrate the correctness of the design. Relevant experiments have to be designed and conducted that allow the drawing of unambiguous and useful conclusions. Finally, the project has to be described in a well structured way in a report and a presentation.

Specific directives and criteria for grading are available in the official course syllabus.

## **Degree**

The Master's degree is obtained after completion of the courses and the thesis with a total of at least 120hp. The degree awarded is "Teknologie masterexamen", translated into English as "Degree of Master of Science (two years)".

The degree is awarded after application from the student. Application for degree is made through the Personal menu at [www.kth.se](http://www.kth.se).

[Appendix 1 - Course list](#)

[Appendix 2 - Programme syllabus descriptions](#)



# Appendix 1: Course list

Master's Programme, Software Engineering of Distributed Systems, 120 credits (TSEDM), Programme syllabus for studies starting in autumn 2018

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## General courses

### Year 1

#### Mandatory courses (22.5 Credits)

Course code	Course name	Credits	Edu. level
<a href="#">ID2201</a>	<a href="#">Distributed Systems, Basic Course</a>	7.5 hp	Second cycle
<a href="#">ID2207</a>	<a href="#">Modern Methods in Software Engineering</a>	7.5 hp	Second cycle
<a href="#">ID2209</a>	<a href="#">Distributed Artificial Intelligence and Intelligent Agents</a>	7.5 hp	Second cycle

#### Optional courses

Course code	Course name	Credits	Edu. level
<a href="#">ID2010</a>	<a href="#">Programming of Interactive Systems</a>	7.5 hp	Second cycle
<a href="#">ID2012</a>	<a href="#">Ubiquitous Computing</a>	7.5 hp	Second cycle
<a href="#">ID2204</a>	<a href="#">Constraint Programming</a>	7.5 hp	Second cycle
<a href="#">ID2210</a>	<a href="#">Distributed Computing, Peer-to-Peer and GRIDS</a>	7.5 hp	Second cycle
<a href="#">IK2206</a>	<a href="#">Internet Security and Privacy</a>	7.5 hp	Second cycle

### Year 2

#### Mandatory courses (37.5 Credits)

Course code	Course name	Credits	Edu. level
<a href="#">II2202</a>	<a href="#">Research Methodology and Scientific Writing</a>	7.5 hp	Second cycle
<a href="#">II246X</a>	<a href="#">Degree Project in Computer Science and Engineering, Second Cycle</a>	30.0 hp	Second cycle

## Optional courses

Course code	Course name	Credits	Edu. level
<a href="#">ID2221</a>	<a href="#">Data-Intensive Computing</a>	7.5 hp	Second cycle
<a href="#">ID2222</a>	<a href="#">Data Mining</a>	7.5 hp	Second cycle
<a href="#">ID2223</a>	<a href="#">Scalable Machine Learning and Deep Learning</a>	7.5 hp	Second cycle
<a href="#">II2300</a>	<a href="#">Product Realization Processes I</a>	7.5 hp	Second cycle
<a href="#">IK2206</a>	<a href="#">Internet Security and Privacy</a>	7.5 hp	Second cycle

## Track, Data Science (DASC)

### Year 1

#### Mandatory courses (22.5 Credits)

Course code	Course name	Credits	Edu. level
<a href="#">ID2201</a>	<a href="#">Distributed Systems, Basic Course</a>	7.5 hp	Second cycle
<a href="#">ID2207</a>	<a href="#">Modern Methods in Software Engineering</a>	7.5 hp	Second cycle
<a href="#">ID2209</a>	<a href="#">Distributed Artificial Intelligence and Intelligent Agents</a>	7.5 hp	Second cycle

#### Optional courses

Course code	Course name	Credits	Edu. level
<a href="#">ID2010</a>	<a href="#">Programming of Interactive Systems</a>	7.5 hp	Second cycle
<a href="#">ID2012</a>	<a href="#">Ubiquitous Computing</a>	7.5 hp	Second cycle
<a href="#">ID2204</a>	<a href="#">Constraint Programming</a>	7.5 hp	Second cycle
<a href="#">ID2210</a>	<a href="#">Distributed Computing, Peer-to-Peer and GRIDS</a>	7.5 hp	Second cycle
<a href="#">IK2206</a>	<a href="#">Internet Security and Privacy</a>	7.5 hp	Second cycle

#### Conditionally elective courses

Course code	Course name	Credits	Edu. level
<a href="#">ID2203</a>	<a href="#">Distributed Systems, Advanced Course</a>	7.5 hp	Second cycle
<a href="#">ID2208</a>	<a href="#">Programming Web-Services</a>	7.5 hp	Second cycle

#### Supplementary information

At least 30 ECTS must be taken from the conditionally elective courses from corresponding track.

### Year 2

## Mandatory courses (37.5 Credits)

Course code	Course name	Credits	Edu. level
<a href="#">II2202</a>	<a href="#">Research Methodology and Scientific Writing</a>	7.5 hp	Second cycle
<a href="#">II246X</a>	<a href="#">Degree Project in Computer Science and Engineering, Second Cycle</a>	30.0 hp	Second cycle

## Optional courses

Course code	Course name	Credits	Edu. level
<a href="#">II2300</a>	<a href="#">Product Realization Processes I</a>	7.5 hp	Second cycle
<a href="#">IK2206</a>	<a href="#">Internet Security and Privacy</a>	7.5 hp	Second cycle

## Conditionally elective courses

Course code	Course name	Credits	Edu. level
<a href="#">ID2221</a>	<a href="#">Data-Intensive Computing</a>	7.5 hp	Second cycle
<a href="#">ID2222</a>	<a href="#">Data Mining</a>	7.5 hp	Second cycle
<a href="#">ID2223</a>	<a href="#">Scalable Machine Learning and Deep Learning</a>	7.5 hp	Second cycle

## Supplementary information

At least 30 ECTS must be taken from the conditionally elective courses from corresponding track.

## Track, Software (PVT)

### Year 1

#### Mandatory courses (22.5 Credits)

Course code	Course name	Credits	Edu. level
<a href="#">ID2201</a>	<a href="#">Distributed Systems, Basic Course</a>	7.5 hp	Second cycle
<a href="#">ID2207</a>	<a href="#">Modern Methods in Software Engineering</a>	7.5 hp	Second cycle
<a href="#">ID2209</a>	<a href="#">Distributed Artificial Intelligence and Intelligent Agents</a>	7.5 hp	Second cycle

#### Optional courses

Course code	Course name	Credits	Edu. level
<a href="#">ID2010</a>	<a href="#">Programming of Interactive Systems</a>	7.5 hp	Second cycle



<a href="#">ID2012</a>	<a href="#">Ubiquitous Computing</a>	7.5 hp	Second cycle
<a href="#">IK2206</a>	<a href="#">Internet Security and Privacy</a>	7.5 hp	Second cycle

### Conditionally elective courses

Course code	Course name	Credits	Edu. level
<a href="#">ID1212</a>	<a href="#">Network Programming</a>	7.5 hp	First cycle
<a href="#">ID2203</a>	<a href="#">Distributed Systems, Advanced Course</a>	7.5 hp	Second cycle
<a href="#">ID2204</a>	<a href="#">Constraint Programming</a>	7.5 hp	Second cycle
<a href="#">ID2208</a>	<a href="#">Programming Web-Services</a>	7.5 hp	Second cycle
<a href="#">ID2210</a>	<a href="#">Distributed Computing, Peer-to-Peer and GRIDS</a>	7.5 hp	Second cycle

### Supplementary information

At least 30 ECTS must be taken from the conditionally elective courses from corresponding track.

## Year 2

### Mandatory courses (37.5 Credits)

Course code	Course name	Credits	Edu. level
<a href="#">II2202</a>	<a href="#">Research Methodology and Scientific Writing</a>	7.5 hp	Second cycle
<a href="#">II246X</a>	<a href="#">Degree Project in Computer Science and Engineering, Second Cycle</a>	30.0 hp	Second cycle

### Optional courses

Course code	Course name	Credits	Edu. level
<a href="#">ID2221</a>	<a href="#">Data-Intensive Computing</a>	7.5 hp	Second cycle
<a href="#">ID2222</a>	<a href="#">Data Mining</a>	7.5 hp	Second cycle
<a href="#">ID2223</a>	<a href="#">Scalable Machine Learning and Deep Learning</a>	7.5 hp	Second cycle
<a href="#">II2300</a>	<a href="#">Product Realization Processes I</a>	7.5 hp	Second cycle
<a href="#">IK2206</a>	<a href="#">Internet Security and Privacy</a>	7.5 hp	Second cycle

### Conditionally elective courses

Course code	Course name	Credits	Edu. level
<a href="#">ID2213</a>	<a href="#">Logic Programming</a>	7.5 hp	Second cycle

### Supplementary information

At least 30 ECTS must be taken from the conditionally elective courses from corresponding track.



## **Appendix 2: Specialisations**

Master's Programme, Software Engineering of Distributed Systems, 120 credits (TSEDM), Programme syllabus for studies starting in autumn 2018

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**Track, Data Science (DASC)**

**Track, Software (PVT)**