Programme syllabus

Master's Programme, Network Services and Systems, 120 credits
Masterprogram, nätverkstjänster och system
120.0 credits

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

The Master’s programme in Network Services and Systems is a course based programme aimed at the field of communication which has radically changed our lives and societies. We now take communication services that only have become widely available during the last ten years for granted: for instance, the Web and its search engines; Internet and mobile telephony or peer-to-peer file sharing and social networks. The Master’s programme in Network Services and Systems covers the foundations of Internetworking, wireless networks, network security and management of large distributed systems.

Knowledge and understanding

For the Master’s Degree, the student should be able to know and understand:

- The scientific fundamentals and practical applications of computer communication for both wired and wireless networks
- Protocol models and their realization, considering wireless networks and internet protocols, network security and network management
- Deep understanding in areas emerging networking technologies, network security, large distributed systems, IT system management
- Mathematical modeling, simulation methodology and systems experimentation for functional and performance evaluation
- Scientific methodology and its application on the field of the program.

Skills and abilities

For the Master’s Degree, the student should be able to:

- mathematically analyze network functions and protocols,
- specify, design and construct parts of communication systems and to implement them in software
- present technical systems and results from studies both orally and in writing, as well as to hold demonstrations of systems
- work independently and in group, to plan and lead work, critically evaluate the quality of own work and to be able to continuously improve it
- read and understand research results within the field and to apply the results.

Ability to make judgements and adopt a standpoint

For the Master’s Degree, the student should be able to:

- apply a scientific approach to his or her own technical work
• be conscious of the possibilities and limitations of technology, its role in society and how it is being used nationally and internationally
• be aware of ethical issues concerning research and development.

**Extent and content of the programme**

The program is at the second level and comprises two years of full time study, 120 higher education credits, corresponding to 120 ECTS credits. The language of instruction throughout the program is English. The program offers two tracks:

• Design and Technology: network services, network technology, safety and modelling
• Enterprise: IT-management and enterprise architecture

**Eligibility and selection**

**Basic eligibility**

Basic eligibility to be accepted to the master’s programme requires that the applicant has a degree on the first level consisting of at least 180 higher education credits or a corresponding foreign degree.

**Specific eligibility**

Specific eligibility to the programme requires that the previous degree include:

• at least 30 higher education credits (corresponding to 6 months of full time studies) of course work in electrical engineering, computer engineering or computer science
• basic courses in mathematics, including calculus, linear algebra and mathematical statistics
• courses passed with distinction in programming (preferably C or Java).
• Good knowledge of English, equivalent to English 6.

It is recommended that applicants have experience in solving problems using computational software, particularly MATLAB, and passed courses covering operating systems and signals and systems.

The specific eligibility requirements can be assessed as not-fulfilled if the average grade is less than 75% of the highest average grade.

**Selection**

The number of places in the masters program is limited. 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.

**Implementation of the education**

**Structure of the education**

The study year for KTH's undergraduate education is divided into two semesters, each with two study periods (four study periods in total over the year). Each study period is followed by an exam period. For detailed information about the academic year please see the KTH student web.

The programme comprises 2 years of full-time studies (120 higher education credits) including a half-year degree project (30 higher education credits).

**Courses**

The programme is course-based. Lists of courses are included in appendix 1.
The courses selected from the tracks have to lead to deep knowledge in one of the selected areas of network systems, network services, network security, analytic modeling, or IT system management. Finally, courses can be freely selected from all KTH courses.

**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.

The grades pass (P) and fail (F) are also used for the degree project.

Since the grading systems differ between different countries, the grades from studies abroad will not be transferred to the KTH grading system.

**Conditions for participation in the programme**

Registration for the term

All students accepted to a programme must register for each term they intend to actively pursue studies. For newly admitted students this is done in connection with the compulsory registration meeting at beginning of term. For all following terms of the program, the student enters the registration for the term via their Personal Menu at www.kth.se. The registration is possible during a limited time period. This registration is necessary for reporting of results and required so that student’s stipend (studiemedel) can be disbursed by CSN.

Course Selection

The selection of courses for the coming term must be done by the student via the www.antagning.se with the students KTH-account:

- May 1-15th for the fall term
- November 1-15th for the spring term

Course registration

Each student must before every study period register for all courses they are admitted to. The course registration is either done via the Personal Menu at www.kth.se or according to instructions from the course coordinator or the department giving the course. If the student decides not to take a course, then the student should notify the course administrator.

Conditions for being promoted to the next level

For promotion to study year two, the student must have received at least 45 higher education credits from the first year. In order to receive the degree, the student must fulfil the criteria for at least one of the specializations.

**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.

For further information on recognition of previous academic studies, see the KTH:s regelverk

**Studies abroad**

Exchange studies are available through a number of agreements between KTH and other universities. The Degree project (Master’s Thesis project) can be performed abroad providing the student has an advisor and examiner at KTH and an advisor at the receiving institution or company, and that the work follows the KTH regulations for a degree projects.
Degree project

General rules and guidelines for the thesis and grading of the thesis are described in the KTH regulations. The degree project comprises 30 higher education credits corresponding to 20 weeks of full time studies. In order to start the degree project, the student must have passed at least 60 higher education credits of completed courses at least 30 higher education credits should be in depth studies on the second cycle level within the area of technology for which the degree is being prepared.

The degree project should be performed within the area of technology for which the degree is being prepared. The degree project is carried out individually and must be within an area corresponding to the courses which the student has taken. Before the degree project is started, it must be approved both by the KTH examiner and the program director.

The degree project is graded according to the P-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

Students who have successfully completed the two-year Master's programme in Network Services and Systems (120 ECTS) can apply for a "Teknologiemasterexamen", translated into English as "Degree of Master of Science (two years)".

To be able to apply for the degree the student has to fulfill the national qualification requirements and have completed courses corresponding to 120 higher education credits including:

- At least 90 higher education credits, including the obligatory courses
- At least 22.5 higher education credits according to the track requirements.
- Between 6 to 15 higher education credits non-technical courses
- Degree Project for 30 higher education credits.

The student applies for their degree via the "Personal Menu" at www.kth.se.

KTH's local degree ordinance is available in their entirety in the KTH regulatory framework that can be found on the intranet. The main subject for the degree will be stated in the degree certificate.

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

Master's Programme, Network Services and Systems, 120 credits (TNSSM), Programme syllabus for studies starting in autumn 2016

## General courses

### Year 1

#### Mandatory courses (33.0 credits)

<table>
<thead>
<tr>
<th>Course code</th>
<th>Course name</th>
<th>Credits</th>
<th>Edu. level</th>
</tr>
</thead>
<tbody>
<tr>
<td>AK2036</td>
<td>Theory and Methodology of Science with Applications (Natural and Technological Science)</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>EP2120</td>
<td>Internetworking</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>EP2220</td>
<td>The Sustainable Networked Systems Engineer</td>
<td>3.0</td>
<td>Second cycle</td>
</tr>
<tr>
<td>EP2500</td>
<td>Networked Systems Security</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>EP2950</td>
<td>Wireless Networks</td>
<td>7.5</td>
<td>Second 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>DD2385</td>
<td>Software Engineering</td>
<td>6.0</td>
<td>Second cycle</td>
</tr>
<tr>
<td>EH2770</td>
<td>IT Management with Enterprise Architecture I</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>EP2200</td>
<td>Queuing Theory and Teletraffic Systems</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>EP2520</td>
<td>Building Networked Systems Security</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>EQ2870</td>
<td>Machine to machine communication</td>
<td>6.0</td>
<td>Second cycle</td>
</tr>
<tr>
<td>IK2213</td>
<td>Network Services and Internet-based Applications</td>
<td>7.5</td>
<td>Second 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>DD2310</td>
<td>Java Programming for Python Programmers</td>
<td>1.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>DD2448</td>
<td>Foundations of Cryptography</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>EP2800</td>
<td>Individual Project in Networked Systems</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>EQ2330</td>
<td>Image and Video Processing</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>IK2220</td>
<td>Software Defined Networking (SDN) and Network Functions Virtualization (NFV)</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
</tbody>
</table>

Supplementary information

Course list: Information is based upon the curriculum for academic year 2015/2016. Changes may occur.

Degree Requirements for the two year program:

Select one track and at least 22.5 ECTS conditionally elective courses within the track.

Complement up to 120cr with elective courses.

All conditionally elective courses are also recommended electives.

Year 2

Mandatory courses (40.5 credits)

<table>
<thead>
<tr>
<th>Course code</th>
<th>Course name</th>
<th>Credits</th>
<th>Edu. level</th>
</tr>
</thead>
<tbody>
<tr>
<td>EP2220</td>
<td>The Sustainable Networked Systems Engineer</td>
<td>3.0</td>
<td>Second cycle</td>
</tr>
<tr>
<td>EP2300</td>
<td>Management of Networks and Networked Systems</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>EP242X</td>
<td>Degree Project in Communication Networks, Second Cycle</td>
<td>30.0</td>
<td>Second 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>EH2781</td>
<td>IT Management with Enterprise Architecture II, Case Studies Track - Enterprise, conditionally elective</td>
<td>15.0</td>
<td>Second cycle</td>
</tr>
<tr>
<td>EL2745</td>
<td>Principles of Wireless Sensor Networks Track - Design and Technology, conditionally elective</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>EP2210</td>
<td>Performance Analysis of Communication Networks Track - Design and Technology, conditionally elective</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>EP2510</td>
<td>Advanced Networked Systems Security Track - Design and Technology, conditionally elective</td>
<td>7.5</td>
<td>Second 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>EH2030</td>
<td>Business Development and Quality Management</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>EH2720</td>
<td>Management of Projects</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>EP2520</td>
<td>Building Networked Systems Security</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>EP2800</td>
<td>Individual Project in Networked Systems</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>EQ2461</td>
<td>Seminars in Information and Network Engineering</td>
<td>3.0</td>
<td>Second cycle</td>
</tr>
<tr>
<td>LS2439</td>
<td>English for Writing and Presenting a Degree Project in Science and Engineering</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
</tbody>
</table>

### Supplementary information

Course list: Information is based upon the curriculum for academic year 2015/2016. Changes may occur.

Degree requirements

- 40.5 hp compulsory course
- 22.5-30 hp conditionally elective course
- 22.5-30 hp elective course
- 30 hp master thesis

EP2400 will be dormant the academic year 2017-2018.

#### Year 3
Appendix 2: Specialisations

Master's Programme, Network Services and Systems, 120 credits (TNSSM), Programme syllabus for studies starting in autumn 2016

This programme has no specialisations.