



Programme syllabus

Master's Programme, Information and Network Engineering, 120 credits

Masterprogram, information och nätverksteknologi

120.0 credits

Valid for students admitted to the education from autumn 19 (HT - Autumn term; VT - Spring term).

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

Programme objectives

The aim of the program is to provide a mathematical foundation for wireless and wired communication, communication networks, and analysis of information and data in networks. The student gets the opportunity to obtain deeper knowledge on both theory and applications within networks, digital communications, and information or media processing.

Knowledge and understanding

For the master's degree, the student should:

- show knowledge and understanding within communication, communication networks, information and signal processing, including an overview of the area as well as substantially deeper knowledge within at least one of the above mentioned specializations.
- Show deepened knowledge about methods within the area.

Skills and abilities

For the master's degree, the student should be able to:

- use suitable mathematical methods and models to formulate, design and analyze solutions within the problem area and implement them in software.
- present and discuss technical systems and solutions, both orally and in writing.
- 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:

- show the ability to, within the technical area, make judgments with regards to relevant scientific, social, and ethical aspects and show awareness about ethical aspects in research and development work
- show insight about technology's possibilities and limitations, its role in society and humans' responsibility for how it is used
- Show the ability to identify his/her need for further knowledge and take responsibility for developing his/her knowledge.

Extent and content of the programme

The programme is on the second level and comprises 120 higher education credits (equivalent to 120 ECTS) corresponding to two years of full-time studies.

The language of instruction throughout the programme is English.

The following tracks are offered:

- Networked Systems
- Information Engineering
- Communications Engineering
- Multimedia Processing and Analysis

Eligibility and selection

General admission requirements (a degree on the first level consisting of at least 180 higher education credits or a corresponding foreign degree) and the following special admission requirements must be fulfilled in order to be admitted:

- Previous education must include at least 6 months of studies (corresponding 30 higher education credits) within electrical engineering, electronics, computer engineering, computer science or applied mathematics.
- Previous education must also include basic mathematics courses within single variable and multivariable calculus, linear algebra and mathematical statistics or probability theory.
- The student must have passed at least one course in computer programming (preferably C or Python).
- The student must have passed a course on signals and systems, including material about time-continuous and time-discrete systems, sampling, linear filters and systems, and transform methods (Fourier, Laplace and Z).
- A good knowledge of English, equivalent to Eng 6.

It is recommended that the applicant has experience of problem solving using numerical computing languages like MATLAB.

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, and relevant work experience). The evaluation scale is 1-75.

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 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 programme comprises 34.5 higher education credits of common compulsory courses and 30 higher education credits track specific compulsory courses. The remaining 24.5 higher education credits of elective technical or complementary courses are preferably selected from the course list (see appendix 1) or among other 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.

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.

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.

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.

Degree

Students who have successfully completed the two-year Master's programme in Information and Network Engineering (120 ECTS) can apply for a 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
- All compulsory courses from the course list of the program
- The compulsory course requirements of at least one of the tracks
- Passed Degree Project 30 higher education credits

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, Information and Network Engineering, 120 credits (TINNM),
Programme syllabus for studies starting in autumn 2019

General courses

Year 1

Mandatory courses (34.5 credits)

Course code	Course name	Credits	Edu. level
AK2036	Theory and Methodology of Science with Applications (Natural and Technological Science)	7.5	Second cycle
EP2120	Internetworking	7.5	Second cycle
EQ1220	Signal Theory	7.5	First cycle
EQ2222	The Sustainable Information and Network Engineer	3.0	Second cycle
EQ2310	Digital Communications	9.0	Second cycle

Recommended courses

Course code	Course name	Credits	Edu. level
AK1213	Swedish Society, Culture and Industry in Historical Perspective	7.5	First cycle
DD2423	Image Analysis and Computer Vision	7.5	Second cycle
EH2030	Business Development and Quality Management	7.5	Second cycle
EH2720	Management of Projects	7.5	Second cycle
EH2770	IT Management with Enterprise Architecture I	7.5	Second cycle
EI2400	Applied Antenna Theory	7.5	Second cycle
EL2805	Reinforcement Learning	7.5	Second cycle
EN2720	Ethical Hacking	7.5	Second cycle
EP2200	Queuing Theory and Teletraffic Systems	7.5	Second cycle
EP2500	Networked Systems Security	7.5	Second cycle
EP2520	Building Networked Systems Security	7.5	Second cycle
EP2700	Principles of Wireless Sensor Networks	7.5	Second cycle

Course code	Course name	Credits	Edu. level
EP2790	Security Analysis of Large-Scale Computer Systems	7.5	Second cycle
EP2950	Wireless Networks	7.5	Second cycle
EQ2300	Digital Signal Processing	7.5	Second cycle
EQ2321	Speech and Audio Processing	7.5	Second cycle
EQ2330	Image and Video Processing	7.5	Second cycle
EQ2341	Pattern Recognition and Machine Learning	7.5	Second cycle
EQ2401	Adaptive Signal Processing	7.5	Second cycle
EQ2411	Advanced Digital Communications	7.5	Second cycle
EQ2461	Seminars in Information and Network Engineering	3.0	Second cycle
EQ2810	Estimation Theory, Accelerated Program Course	6.0	Second cycle
EQ2820	Matrix Algebra, Accelerated Program	7.5	Second cycle
EQ2845	Information Theory and Source Coding	7.5	Second cycle
EQ2850	Coding for Wireless Communications, Accelerated Program	7.5	Second cycle
EQ2860	Theoretical Foundations of Wireless Communications	7.5	Second cycle
EQ2871	Cyber-Physical Networking	7.5	Second cycle
ID1018	Programming I	7.5	First cycle
ID1212	Network Programming	7.5	First cycle
IK2217	Advanced Internetworking II	7.5	Second cycle
IK2220	Software Defined Networking (SDN) and Network Functions Virtualization (NFV)	7.5	Second cycle
LS1465	Rhetoric - Speaking and Writing for Impact	7.5	First cycle
LS1502	Swedish A1 for Engineers	7.5	First cycle
LS2429	Technical Communication in English	7.5	Second cycle
LS2439	English for Writing and Presenting a Degree Project in Science and Engineering	7.5	Second cycle
ME1003	Industrial Management, Basic Course	6.0	First cycle
ME2072	Entrepreneurship for Engineers	6.0	Second cycle
ME2089	Leadership in Cross-Cultural and Industrial Contexts	6.0	Second cycle
SF2822	Applied Nonlinear Optimization	7.5	Second cycle

Supplementary information

EQ1220 shouldn't be included for students from KTH, who have already passed EQ1270 or EQ1260.

Year 2

Mandatory courses (3.0 credits)

Course code	Course name	Credits	Edu. level
EQ2222	The Sustainable Information and Network Engineer	3.0	Second cycle

Recommended courses

Course code	Course name	Credits	Edu. level
AK1213	Swedish Society, Culture and Industry in Historical Perspective	7.5	First cycle
DD2434	Machine Learning, Advanced Course	7.5	Second cycle
EH2030	Business Development and Quality Management	7.5	Second cycle
EL2805	Reinforcement Learning	7.5	Second cycle
EP2210	Performance Analysis of Communication Networks	7.5	Second cycle
EP2300	Management of Networks and Networked Systems	7.5	Second cycle
EP2420	Network Analytics	7.5	Second cycle
EP2510	Advanced Networked Systems Security	7.5	Second cycle
EP2700	Principles of Wireless Sensor Networks	7.5	Second cycle
EP2790	Security Analysis of Large-Scale Computer Systems	7.5	Second cycle
EQ2415	Machine Learning and Data Science	7.5	Second cycle
EQ2425	Analysis and Search of Visual Data	7.5	Second cycle
EQ2443	Project in Information Engineering	7.5	Second cycle
EQ2444	Project in Communication Engineering	7.5	Second cycle
EQ2445	Project in Multimedia Processing and Analysis	7.5	Second cycle
EQ2801	Optimal Filtering	7.5	Second cycle
EQ2831	Foundations in Digital Communications	7.5	Second cycle
EQ2840	Information Theory and Channel Coding, Accelerated Program	7.5	Second cycle
IK2510	Wireless Networks	7.5	Second cycle
IK2514	Wireless Infrastructure Deployment & Economics	7.5	Second cycle
LS1419	English for Employment	7.5	First cycle
LS1465	Rhetoric - Speaking and Writing for Impact	7.5	First cycle
LS1502	Swedish A1 for Engineers	7.5	First cycle
LS2429	Technical Communication in English	7.5	Second cycle
LS2439	English for Writing and Presenting a Degree Project in Science and Engineering	7.5	Second cycle

Course code	Course name	Credits	Edu. level
ME2072	Entrepreneurship for Engineers	6.0	Second cycle
ME2089	Leadership in Cross-Cultural and Industrial Contexts	6.0	Second cycle
SF2935	Modern Methods of Statistical Learning	7.5	Second cycle

Year 3

Track, Communications Engineering (COE)

Year 1

Mandatory courses (22.5 credits)

Course code	Course name	Credits	Edu. level
EP2950	Wireless Networks	7.5	Second cycle
EQ2300	Digital Signal Processing	7.5	Second cycle
EQ2411	Advanced Digital Communications	7.5	Second cycle

Recommended courses

Course code	Course name	Credits	Edu. level
EI2400	Applied Antenna Theory	7.5	Second cycle
EP2200	Queuing Theory and Teletraffic Systems	7.5	Second cycle
EQ2820	Matrix Algebra, Accelerated Program	7.5	Second cycle
EQ2845	Information Theory and Source Coding	7.5	Second cycle
EQ2850	Coding for Wireless Communications, Accelerated Program	7.5	Second cycle
EQ2860	Theoretical Foundations of Wireless Communications	7.5	Second cycle
EQ2871	Cyber-Physical Networking	7.5	Second cycle

Year 2

Mandatory courses (7.5 credits)

Course code	Course name	Credits	Edu. level
EQ2444	Project in Communication Engineering	7.5	Second cycle

Recommended courses

Course code	Course name	Credits	Edu. level
EQ2831	Foundations in Digital Communications	7.5	Second cycle
EQ2840	Information Theory and Channel Coding, Accelerated Program	7.5	Second cycle

Year 3

Track, Information Engineering (INF)

Year 1

Mandatory courses (22.5 credits)

Course code	Course name	Credits	Edu. level
EQ2300	Digital Signal Processing	7.5	Second cycle
EQ2341	Pattern Recognition and Machine Learning	7.5	Second cycle
EQ2401	Adaptive Signal Processing	7.5	Second cycle

Recommended courses

Course code	Course name	Credits	Edu. level
EQ2810	Estimation Theory, Accelerated Program Course	6.0	Second cycle
EQ2820	Matrix Algebra, Accelerated Program	7.5	Second cycle
EQ2845	Information Theory and Source Coding	7.5	Second cycle

Year 2

Mandatory courses (7.5 credits)

Course code	Course name	Credits	Edu. level
EQ2443	Project in Information Engineering	7.5	Second cycle

Recommended courses

Course code	Course name	Credits	Edu. level
DD2434	Machine Learning, Advanced Course	7.5	Second cycle
EQ2415	Machine Learning and Data Science	7.5	Second cycle

Course code	Course name	Credits	Edu. level
EQ2801	Optimal Filtering	7.5	Second cycle
EQ2840	Information Theory and Channel Coding, Accelerated Program	7.5	Second cycle
SF2935	Modern Methods of Statistical Learning	7.5	Second cycle

Year 3

Track, Multimedia Processing and Analysis (MMB)

Year 1

Mandatory courses (22.5 credits)

Course code	Course name	Credits	Edu. level
EQ2321	Speech and Audio Processing	7.5	Second cycle
EQ2330	Image and Video Processing	7.5	Second cycle
EQ2341	Pattern Recognition and Machine Learning	7.5	Second cycle

Recommended courses

Course code	Course name	Credits	Edu. level
DD2423	Image Analysis and Computer Vision	7.5	Second cycle
EQ2300	Digital Signal Processing	7.5	Second cycle
EQ2810	Estimation Theory, Accelerated Program Course	6.0	Second cycle
EQ2845	Information Theory and Source Coding	7.5	Second cycle

Year 2

Mandatory courses (7.5 credits)

Course code	Course name	Credits	Edu. level
EQ2445	Project in Multimedia Processing and Analysis	7.5	Second cycle

Recommended courses

Course code	Course name	Credits	Edu. level
EQ2415	Machine Learning and Data Science	7.5	Second cycle

Course code	Course name	Credits	Edu. level
EQ2425	Analysis and Search of Visual Data	7.5	Second cycle
EQ2801	Optimal Filtering	7.5	Second cycle

Year 3

Track, Networked Systems (NWS)

Year 1

Mandatory courses (22.5 credits)

Course code	Course name	Credits	Edu. level
EP2200	Queuing Theory and Teletraffic Systems	7.5	Second cycle
EP2500	Networked Systems Security	7.5	Second cycle
EP2950	Wireless Networks	7.5	Second cycle

Conditionally elective courses

Course code	Course name	Credits	Edu. level
EP2520	Building Networked Systems Security	7.5	Second cycle

Recommended courses

Course code	Course name	Credits	Edu. level
EH2770	IT Management with Enterprise Architecture I	7.5	Second cycle
EN2720	Ethical Hacking	7.5	Second cycle
EP2790	Security Analysis of Large-Scale Computer Systems	7.5	Second cycle
IK2220	Software Defined Networking (SDN) and Network Functions Virtualization (NFV)	7.5	Second cycle

Supplementary information

At least one of the courses EP2520 and EP2420 must be chosen for the degree.

Year 2

Conditionally elective courses

Course code	Course name	Credits	Edu. level
EP2420	Network Analytics	7.5	Second cycle

Recommended courses

Course code	Course name	Credits	Edu. level
EP2210	Performance Analysis of Communication Networks	7.5	Second cycle
EP2300	Management of Networks and Networked Systems	7.5	Second cycle
EP2510	Advanced Networked Systems Security	7.5	Second cycle
EP2790	Security Analysis of Large-Scale Computer Systems	7.5	Second cycle

Supplementary information

At least one of the courses EP2520 and EP2420 must be chosen for the degree.

Year 3



Appendix 2: Specialisations

Master's Programme, Information and Network Engineering, 120 credits (TINNM),
Programme syllabus for studies starting in autumn 2019

Track, Communications Engineering (COE)

Track, Information Engineering (INF)

Track, Multimedia Processing and Analysis (MMB)

Track, Networked Systems (NWS)