



Programme syllabus

Master's Programme, ICT Innovation, 120 credits

Masterprogram, ICT Innovation

120.0 credits

Valid for students admitted to the education from autumn 12 (HT - Autumn term; VT - Spring term).

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

Programme objectives

The EIT ICT Labs Master School is a two-year program where you can choose two universities in two different European countries to build a curriculum of your choice based on your skills and interest.

The students are offered a double degree (from KTH and other universities that the student has chosen / accepted by), which combines technical competence with a set of skills in Innovation and Entrepreneurship. The double degree complemented with an EIT ICT Labs certificate documenting the EIT ICT Labs specific learning objectives that meet EIT's quality.

The program also attaches great importance to industry switching by offering internship at one of EIT ICT Lab partners, including Ericsson, Nokia, Orange, Philips, SAP and Siemens.

While the student gets an excellent theoretical education they also get the opportunity to work with European top research facilities and leading business partners. The program includes an Internship where students, teachers and our business partners develop a project for the master's thesis at one of EIT ICT Lab partners, including Ericsson, Nokia, Orange, Philips, SAP and Siemens.

Unique features of this program:

- Strong integration of technical education in the ICT field in Europe's premier technical university with a 'business' oriented strand
- Guaranteed quality 'internship' in one of the EIT ICT Labs partner companies as the basis for the thesis
- Flexible combination of organizational and geographical mobility.
- Team-building for all students in the form of 'School and Camp' at European level and the technical subject boundaries.

The main goals for the 'business' oriented parts is a fundamental understanding of and application of:

- Step into a business development process from idea to product
- Marketing and market analysis
- Business Formation, Management and HR work
- Project work and management
- Finance

Objectives of the technical specializations:

Human Computer Interaction and Design (HCID)

This specialization deals with the study, design, development and evaluation of innovative user interfaces and interactive systems with regard to both human aspects (social, cognitive and sensor levels) as well as technical and economic aspects.

Digital Media Technology (DMT)

This specialization focus on basic techniques of digital media systems including techniques for the generation of digital media, processing and encoding of the media, the storage of media content as well as wired and wireless transmission media.

Distributed Services and Systems (DSS)

This specialization deals with distributed systems, advanced networking technologies, services technologies for fixed and mobile systems, distributed information and data management, and programming techniques 'cloud computing'.

Internet technologies and architectures (ITA).

This specialization treats communications systems design, modern network respectively. Internet technology, mobile and wireless technologies, properties of complex communications systems and user aspects.

Embedded Systems (ES)

This specializations focuses on models, methods and platforms for embedded systems, embedded hardware, respectively. software and communications aspects, energy saving and communication aspects.

Knowledge and understanding

For a master's degree in ICT Innovation the student shall:

- Be able to design and evaluate the characteristics of a specific system

- Have good knowledge of current research and development and trends in the industry
- Have good knowledge of the processes, methods and tools used for the development of the specific technology
- Be able to apply science and engineering in a relevant way
- Implement a business development process from idea to product.

Skills and abilities

For a master's degree in ICT Innovation the student shall:

- Demonstrate the ability to create technical solutions that meet human and societal needs
- Show the ability to identify, define, formulate and manage complex problems in the area
- Demonstrate the ability to integrate knowledge in the field
- Analyze the commercial potential of a technical solution and plan the implementation of a commercial exploitation
- Be a good ambassador for the Royal Institute of Technology in industry and elsewhere
- Demonstrate the ability to critically and systematically integrate knowledge and to analyze, assess and deal with complex phenomena, issues and situations, even with limited information
- Demonstrate the ability to critically, independently and creatively identify and formulate issues and to plan and use appropriate methods, carry out advanced tasks within specified time frames, thereby contributing to the development of knowledge and to evaluate this work
- Demonstrate the ability to, national and international, orally and in writing, explain and discuss their conclusions and the knowledge and arguments behind them, in dialogue with different groups, and
- Demonstrate the skills required to participate in research and development work or to work independently in other advanced contexts.

Ability to make judgements and adopt a standpoint

For a master's degree in ICT Innovation the student shall:

- Critical reading / reviewing of technical reports, design documents and business plans
- Evaluate documents strengths and weaknesses and formulate evaluation of concrete and constructive terms.
- 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,
- Show ability to identify her/his need for additional knowledge and take responsibility for the development of his/her own knowledge.

Extent and content of the programme

Extent: 2 years (120 credits)

Level of education: Advanced

Specializations:

- Human Computer Interaction and Design (HCID) - Year 1 + 2
- Digital Media Technologies (DMT) - Year 1 + 2
- Distributed Services and Systems (DSS) - Year 2
- Internet technologies and architectures (ITA) - Year 1 + 2
- Embedded Systems (ES) - Year 1 + 2

Language of education: English

Content: The program has a unified structure that combines 30 ECTS of 'business' oriented classes (Innovation and Entrepreneurship = I & E) with 90 ECTS with specific technical focus. The business-oriented part is fully standardized for all technical directions and all the participating universities.

Eligibility and selection

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.

Language requirements

A good knowledge of written and spoken English. Applicants must provide proof of their proficiency in English. KTH accepts a

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).

Swedish applicants should have a good knowledge of English, equivalent to English B.

Special requirements

Internationally recognized bachelor's degree (Bachelor's degree) - in Electrical / Electronic Engineering, Computer Science, Computer Engineering, Computer Science or Information Technology, including at least 60 ECTS (credits) courses in computer science, basic digital and analogue electronics, basic control theory, computer systems / computer architecture and programming, and at least 30 ECTS in mathematics, including analysis (calculus), linear algebra and mathematical statistics.

The specific requirements may be assessed as not fulfilled if

1. The average grade is in the lower third on the grading scale used (above pass level).
2. The degree awarding institution is not considered to meet acceptable quality standards by the authorities of the country in which the institution is located.
3. The degree does not qualify for admission to equivalent Master level in the country where the degree is awarded.

Selection process

The selection process for the ICT Innovation programme is based on a total evaluation of the following selection criteria: university, GPA, course work related to the programme, and to a minor extent: thesis proposal, working experiences and references.

Implementation of the education

Structure of the education

The program spans over two years, where the first three semesters are devoted to course work, whereas the final semester is aimed for the diploma work. Semester 1 and 2 includes compulsory courses and eligible courses according to the chosen specialization and joint courses in I & E. Term 3 is taken at another university and includes specialized courses in the chosen specialization, as well as compulsory I & E courses. Semester 4 is designed for the diploma work done in collaboration with the ICT Lab partners. A central feature of the ICT Innovation program is mobility. Firstly, there is a change of university between year 1 and year 2, ie. year two is read at a different university than the first year. Second, the program ensures high-quality 'internships' provided by the EIT ICT Labs consortium partner companies (Ericsson, Nokia, Orange, Philips, SAP and Siemens). The topic for the master thesis topic should be based on a problem with industrial relevance. A 6 ECTS thesis focusing on innovation and entrepreneurship will complement the technical 30 ECTS thesis, also with the roots in industrial work. The program also contains a number of joint activities where all students from all universities will meet for cooperation between the different orientations and in project work for EIT ICT Labs various research areas.

Courses

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

The program course list is given 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.

KTH applies a grading scale with seven levels A-F for the final grade for courses at the advanced level. A-E are passing grades where A is the highest. The grades pass (P) and fail (F) may be used in special cases.

Conditions for participation in the programme

Registration for each semester as well as selection of elective courses is web-based and should be completed by November 15 and May 15 (semester 1 and 2 at the University 1 and semester 3 and 4 at University 2, where one of these universities are KTH).

The student chooses first a technically oriented and universities at the time of application. Each student will get an individual study plan. Students can apply for a change in individual study plan during the first half of term 2.

Promotion to the second year of studies is conditional that at least 80% of the requirements for the first year is completed.

Course registration is compulsory and should be done with the course responsible at the beginning of each course.

Recognition of previous academic studies

Possible transfer of credits from previous course work follows the KTH Regulations

Studies abroad

The ICT Innovation program strongly emphasized mobility between the universities. The education takes place at the two universities chosen by the application. Students offered 'double degrees' from the University after completion of studies. The students themselves fund the cost of moving between the two university centers.

For the different Specializations, the following mobility options apply:

Human Computer Interaction and Design (HCID)

- First year: Aalto, KTH, UPS

- Second year: U. of Twente, Aalto, KTH, UPS, TU Berlin, UCL.

Digital Media Technology (DMT)

- First year: TU Delft, Aalto, KTH
- Second year: TU Delft, Aalto U, KTH, BME, UCL.

Distributed Services and Systems (DSS)

- First year, TU Berlin, Aalto, KTH, U. Rennes
- Second year: Royal Institute of Technology, TU Berlin, Aalto, U. Rennes, UPS.

Internet technologies and architectures (ITA)

- First year, TU Berlin, KTH, UPMC, UNS
- Second year: UNITN, KTH, UPMC, TU Berlin, UNS.

Embedded Systems (ES)

- First year: TU / e, Royal Institute of Technology, TU Berlin
- Second year: TU / e, Aalto, KTH, TUCS, TU Berlin, UNITN.

Degree project

General rules and policies regarding the diploma work and its grading can be found in the KTH regulations.

The diploma work amounts to 30 credits, which should equal 20 weeks of full time studies. A student may apply for starting a thesis project given that most of the course work has been accomplished, corresponding to 60 credits out of which at least 30 credits at the advanced level within the major subject of the program.

The thesis topic should be relevant to the ICT Innovation.

The thesis is graded on the scale A-F according to the KTH's policies.

A 6 ECTS thesis focusing on innovation and entrepreneurship will complement the technical 30 ECTS thesis.

Degree

KTH's procedure for awarding degrees is described in the KTH regulations. The Masters degree is awarded after fulfilling all requirements defined by the program. This includes a total of 120 credits out of which 90 credits are at the advanced level and at least 60 credits (including 30 credits for the thesis work) corresponds to advanced level courses within the major subject of the program.

The name of the degree is "Teknologie Mastersexamen", which in English translates to "Degree of Masters of Science (two years)". The program name, ICT Innovation, is indicated on the diploma.

Students who complete the program receive a double degree from KTH and other universities that the student has chosen / accepted by. The double degree complemented with an EIT ICT Labs certificate documenting the EIT ICT Labs specific learning objectives that meet EITs quality.

An application for the degree must be filed by the student and should be directed to the ICT educational office.

[Appendix 1 - Course list](#)

[Appendix 2 - Programme syllabus descriptions](#)



Appendix 1: Course list

Master's Programme, ICT Innovation, 120 credits (TIVNM),
Programme syllabus for studies starting in autumn 2012

General courses

Year 1

Mandatory courses (15.0 Credits)

Course code	Course name	Credits	Edu. level
ME2072	Entrepreneurship for Engineers DMTE, HCID, INSY and ITAK	6.0 hp	Second cycle
ME2073	Business Development Lab of Entrepreneurship Engineers DMTE, HCID, INSY and ITAK	9.0 hp	Second cycle

Conditionally elective courses

Course code	Course name	Credits	Edu. level
ME1033	Open and User Innovation For DMTE, HCID, INSY and ITAK one of these is mandatory: ME1033, ME2062, ME2813.	7.5 hp	First cycle
ME2062	Technology-based Entrepreneurship For DMTE, HCID, INSY and ITAK one of these is mandatory: ME1033, ME2062, ME2813.	7.5 hp	Second cycle
ME2813	Business Model Innovation For DMTE, HCID, INSY and ITAK one of these is mandatory: ME1033, ME2062, ME2813.	7.5 hp	Second cycle

Supplementary information

Choose course connected to the technical specializations

Year 2

Mandatory courses (43.5 Credits)

Course code	Course name	Credits	Edu. level
II2202	Research Methodology and Scientific Writing For Students not taken the Research Methodology and Scientific Writing year 1 (except Human Computer Interaction and Design)	7.5 hp	Second cycle
IL222X	Degree Project in Electronic- and Computer Systems, Second Cycle	30.0 hp	Second cycle
ME2082	Minor Thesis Project within Entrepreneurship	6.0 hp	Second cycle

Supplementary information

Choose course connected to the technical specializations

Distributed Systems and Services (DITS)

Year 1

Supplementary information

All courses year 1 will be taken at another university.

Year 2

Supplementary information

The specialisation is not given during 2013-2014.

Digital Media Technology EIT (DMTE)

Year 1

Mandatory courses (21.0 Credits)

Course code	Course name	Credits	Edu. level
AK2036	Theory and Methodology of Science with Applications (Natural and Technological Science)	7.5 hp	Second cycle
DH2320	Introduction to Visualization and Computer Graphics	6.0 hp	Second cycle
ID2208	Programming Web-Services	7.5 hp	Second cycle

Optional courses

Course

code	Course name	Credits	Edu. level
DD2257	Visualization	7.5 hp	Second cycle
DD2423	Image Analysis and Computer Vision Also choose EQ1220.	7.5 hp	Second cycle
DD2476	Search Engines and Information Retrieval Systems	9.0 hp	Second cycle
EN2500	Information Theory and Source Coding Also choose EQ1220.	7.5 hp	Second cycle
EP2200	Queuing Theory and Teletraffic Systems Also choose EP2120.	7.5 hp	Second cycle
EQ2460	Seminars in Wireless Systems	3.0 hp	Second cycle
EQ2840	Information Theory and Channel Coding, Accelerated Program Also choose EQ1220.	7.5 hp	Second cycle

Conditionally elective courses

Course code	Course name	Credits	Edu. level
EP2120	Internetworking Mandatory for DMTE exit Aalto, BME. Elective for others in DMTE.	7.5 hp	Second cycle
EQ1220	Signal Theory (Educational level: First, not second, cycle.) Mandatory for DMTE exit Delft, UCL. Elective for others in DMTE.	7.5 hp	First cycle

Year 2

Optional courses

Course code	Course name	Credits	Edu. level
DD2429	Computational Photography	6.0 hp	Second cycle
EN2202	Pattern Recognition	7.5 hp	Second cycle
EN2300	Speech Signal Processing	6.0 hp	Second cycle
EQ2300	Digital Signal Processing	7.5 hp	Second cycle
EQ2400	Adaptive Signal Processing	6.0 hp	Second cycle
EQ2410	Advanced Digital Communications	6.0 hp	Second cycle
EQ2460	Seminars in Wireless Systems	3.0 hp	Second cycle

Conditionally elective courses

Course code	Course name	Credits	Edu. level
EN2401	Image and Video Processing	6.0 hp	Second cycle
EQ2310	Digital Communications	9.0 hp	Second cycle

Human Computer Interaction and Design EIT (HCID)

Year 1

Mandatory courses (30.0 Credits)

Course code	Course name	Credits	Edu. level
DH2408	Evaluation Methods in Human-Computer Interaction	6.0 hp	Second cycle
DH2632	Human-Computer Interaction, Research Seminars	3.0 hp	Second cycle
DH2641	Interaction Programming	6.0 hp	Second cycle
IC1007	Human-computer Interaction: Principles and Design	7.5 hp	First cycle
II2202	Research Methodology and Scientific Writing	7.5 hp	Second cycle

Optional courses

Course code	Course name	Credits	Edu. level
DD2431	Machine Learning	6.0 hp	Second cycle
DH2610	Theory and Methodology of Science in Human-Computer Interaction	7.5 hp	Second cycle
DH2626	Interaction Design 1	15.0 hp	Second cycle
DT2140	Multimodal Interaction and Interfaces	7.5 hp	Second cycle
IC2005	Mandatory for students who before TIVNM took a correspondent of IC1007	7.5 hp	Second cycle
ID2209	Distributed Artificial Intelligence and Intelligent Agents	7.5 hp	Second cycle

Year 2

Mandatory courses (22.5 Credits)

Course code	Course name	Credits	Edu. level
DH2400	Physical Interaction Design and Realization	7.5 hp	Second cycle
DH2610	Theory and Methodology of Science in Human-Computer Interaction For Human Computer Interaction and Design Students not taken the Research Methodology and Scientific Writing year 1	7.5 hp	Second cycle
ID2216	Developing Mobile Applications	7.5 hp	Second cycle

Optional courses

Course code	Course name	Credits	Edu. level
DH2660	Haptics	6.0 hp	Second cycle
DT2140	Multimodal Interaction and Interfaces	7.5 hp	Second cycle
ID2012	Ubiquitous Computing	7.5 hp	Second cycle
II2302	Sensor Based Systems	7.5 hp	Second cycle
IK2555	Wireless and Mobile Network Architectures	7.5 hp	Second cycle

Embedded Systems EIT (INSY)

Year 1

Mandatory courses (37.5 Credits)

Course code	Course name	Credits	Edu. level
ID2202	Compilers and Execution Environments	7.5 hp	Second cycle
II2202	Research Methodology and Scientific Writing	7.5 hp	Second cycle
IL2206	Embedded Systems	7.5 hp	Second cycle
IL2212	Embedded Software	7.5 hp	Second cycle
IS2202	Computer Systems Architecture	7.5 hp	Second cycle

Year 2

Mandatory courses (16.5 Credits)

Course code	Course name	Credits	Edu. level
IL2217	Digital Design with HDL	7.5 hp	Second cycle
IL2228	Design Project Course I	9.0 hp	Second cycle

Optional courses

Course code	Course name	Credits	Edu. level
EQ1220	Signal Theory	7.5 hp	First cycle
EQ2310	Digital Communications	9.0 hp	Second cycle
IL2219	Radio Electronics	7.5 hp	Second cycle
IL2225	Embedded Hardware Design in ASIC and FPGA	7.5 hp	Second cycle
IL2226	Embedded System Design	7.5 hp	Second cycle
IL2452	System Design Languages	7.5 hp	Second cycle

Internet Technology and Architecture EIT (ITAK)

Year 1

Mandatory courses (30.0 Credits)

Course code	Course name	Credits	Edu. level
EP2200	Queuing Theory and Teletraffic Systems	7.5 hp	Second cycle
EP2950	Wireless Networks	7.5 hp	Second cycle
II2202	Research Methodology and Scientific Writing	7.5 hp	Second cycle
IK2215	Advanced Internetworking	7.5 hp	Second cycle

Optional courses

Course code	Course name	Credits	Edu. level
EP2500	Networked Systems Security	7.5 hp	Second cycle
ID2216	Developing Mobile Applications	7.5 hp	Second cycle
IK2213	Network Services and Internet-based Applications	7.5 hp	Second cycle
IK2214	Telecom Policies and Regulatory Principles	7.5 hp	Second cycle
IK2217	Advanced Internetworking II	7.5 hp	Second cycle
IK2555	Wireless and Mobile Network Architectures	7.5 hp	Second cycle

Year 2

Mandatory courses (15.0 Credits)

Course code	Course name	Credits	Edu. level
IK2200	Communication System Design	15.0 hp	Second cycle

Optional courses

Course code	Course name	Credits	Edu. level
EP2300	Management of Networks and Networked Systems	7.5 hp	Second cycle
EP2510	Advanced Networked Systems Security	7.5 hp	Second cycle
EP2520	Building Networked Systems Security	7.5 hp	Second cycle
IK2206	Internet Security and Privacy	7.5 hp	Second cycle

Security and Privacy (SAPR)

Year 1

Supplementary information

The specialisation is not given during 2012-2013

Year 2

Supplementary information

The specialisation is not given during 2012-2013

Service Design and Engineering (SDEN)

Year 1

Supplementary information

The specialisation is not given during 2012-2013

Year 2

Supplementary information

The specialisation is not given during 2012-2013



Appendix 2: Specialisations

Master's Programme, ICT Innovation, 120 credits (TIVNM),
Programme syllabus for studies starting in autumn 2012

Distributed Systems and Services (DITS)

Digital Media Technology EIT (DMTE)

Human Computer Interaction and Design EIT (HCID)

Embedded Systems EIT (INSY)

Internet Technology and Architecture EIT (ITAK)

Security and Privacy (SAPR)

Service Design and Engineering (SDEN)