Programme syllabus

Master's Programme, ICT Innovation, 120 credits
Masterprogram, ICT Innovation
120.0 credits

Valid for students admitted to the education from autumn 13 (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 EITs quality.

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 focuses 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 specialization 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**

Applicants must provide proof of their English language proficiency, which is generally established through an internationally recognized test.

The consortium accepts:
IELTS Academic Training test (www.ielts.org). An overall band score of at least 6.5, with no section lower than 6, is required.
TOEFL Internet-based test, iBT (www.toefl.org). A total score of at least 92 (with writing section 22) is required.
University of Cambridge/ University of Oxford Certificates:
Certificate in Advanced English (CAE): grades A- C are accepted.
Certificate of Proficiency in English (CPE): grades A- C are accepted.
English proficiency tests are waived for applicants who:
• have completed a higher education degree instructed in English at a university or a university of applied sciences in an EU/EEA country.
• have completed a degree instructed in English at a university that is physically located in one of the following countries: USA, Canada, UK, Ireland, Australia or New Zealand.

KTH also accepts:
• TOEFL PBT (paper-based test) : Score of 4.5 (scale 1-6) in written test, total score of 575
• Students with 30 higher education credits (equivalent to 30 ECTS credits) from an EU/EEA country or Switzerland where the language of instruction of the course is English.
• Students with a Bachelor's degree (equivalent to 180 ECTS credits) in Engineering, Computer Science, Computer Applications, Medicine, Pharmacy, Science or Technology from India or Pakistan.
• Students with a Bachelor's degree from a university where English is the only language of instruction, in accordance with the recommendations in the edition of the International Handbook of Universities that was current the year the degree was awarded.
• Students with a Bachelor's degree (equivalent to 180 ECTS credits) where English is the main subject.
• Students with 30 higher education credits (equivalent to 30 ECTS credits) from Great Britain, Ireland, Malta, USA, Australia, New Zealand, Jamaica, or English speaking parts of Canada.
• Students with a formal transcript or degree certificate where it is clearly stated that the language of instruction was English.
• Turkish students who have studied a 1 year preparatory class in English at a University.
• In some cases English proficiency can be fulfilled from upper secondary education, e.g. GCE O-level (minimum grade C).

**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: Suitability of acquired bachelor degree for intended study programme, Academic excellence, Entrepreneurial excellence and Innovative potential.
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, i.e. 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. 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, 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, UNITN
- Second year: UNITN, KTH, UPMC, TU Berlin, UNS.

Embedded Systems (ES)
- First year: TU / e, KTH, 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 polices.

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

**Degree**

KTHs 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 2013

General courses

Year 1

Mandatory courses (19.0 Credits)

<table>
<thead>
<tr>
<th>Course code</th>
<th>Course name</th>
<th>Credits Edu. level</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME2072</td>
<td>Entrepreneurship for Engineers</td>
<td>6.0 hp  Second cycle</td>
</tr>
<tr>
<td>ME2073</td>
<td>Business Development Lab of Entrepreneurship Engineers</td>
<td>9.0 hp  Second cycle</td>
</tr>
<tr>
<td>ME2078</td>
<td>Summer Course- Entrepreneurship for Engineers</td>
<td>4.0 hp  Second cycle</td>
</tr>
</tbody>
</table>

Conditionally elective courses

<table>
<thead>
<tr>
<th>Course code</th>
<th>Course name</th>
<th>Credits Edu. level</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME1033</td>
<td>Open and User Innovation</td>
<td>7.5 hp  First cycle</td>
</tr>
<tr>
<td>ME2062</td>
<td>Technology-based Entrepreneurship</td>
<td>7.5 hp  Second cycle</td>
</tr>
<tr>
<td>ME2815</td>
<td>Business Model Innovation</td>
<td>7.5 hp  Second cycle</td>
</tr>
</tbody>
</table>

Supplementary information

Choose course connected to the technical specializations

Year 2
Mandatory courses (43.5 Credits)

<table>
<thead>
<tr>
<th>Course code</th>
<th>Course name</th>
<th>Credits</th>
<th>Edu. level</th>
</tr>
</thead>
<tbody>
<tr>
<td>II2202</td>
<td>Research Methodology and Scientific Writing</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>IL222X</td>
<td>Degree Project in Electronic- and Computer Systems, Second Cycle</td>
<td>30.0 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>ME2082</td>
<td>Minor Thesis Project within Entrepreneurship</td>
<td>6.0 hp</td>
<td>Second cycle</td>
</tr>
</tbody>
</table>

Supplementary information

Choose course connected to the technical specializations

**Distributed Systems and Services (DITS)**

**Year 1**

Supplementary information

All year 1 courses within this specialization is given at another university.

**Year 2**

Mandatory courses (7.5 Credits)

<table>
<thead>
<tr>
<th>Course code</th>
<th>Course name</th>
<th>Credits</th>
<th>Edu. level</th>
</tr>
</thead>
<tbody>
<tr>
<td>ID2220</td>
<td>Advanced Topics in Distributed Systems</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
</tbody>
</table>

Optional courses

<table>
<thead>
<tr>
<th>Course code</th>
<th>Course name</th>
<th>Credits</th>
<th>Edu. level</th>
</tr>
</thead>
<tbody>
<tr>
<td>DD2431</td>
<td>Machine Learning</td>
<td>6.0 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>EP2400</td>
<td>Network Algorithms</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>ID2207</td>
<td>Modern Methods in Software Engineering</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>ID2208</td>
<td>Programming Web-Services</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>ID2209</td>
<td>Distributed Artificial Intelligence and Intelligent Agents</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
</tbody>
</table>

**Digital Media Technology EIT (DMTE)**

**Year 1**

Mandatory courses (21.0 Credits)
<table>
<thead>
<tr>
<th>Course code</th>
<th>Course name</th>
<th>Credits Edu. level</th>
</tr>
</thead>
<tbody>
<tr>
<td>AK2036</td>
<td><strong>Theory and Methodology of Science with Applications</strong>&lt;br&gt;(Natural and Technological Science)</td>
<td>7.5 hp Second cycle</td>
</tr>
<tr>
<td>DH2320</td>
<td><strong>Introduction to Visualization and Computer Graphics</strong></td>
<td>6.0 hp Second cycle</td>
</tr>
<tr>
<td>ID2208</td>
<td><strong>Programming Web-Services</strong></td>
<td>7.5 hp Second cycle</td>
</tr>
</tbody>
</table>

Optional courses

<table>
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<tr>
<th>Course code</th>
<th>Course name</th>
<th>Credits Edu. level</th>
</tr>
</thead>
<tbody>
<tr>
<td>DD2257</td>
<td><strong>Visualization</strong></td>
<td>7.5 hp Second cycle</td>
</tr>
<tr>
<td>DD2423</td>
<td><strong>Image Analysis and Computer Vision</strong></td>
<td>7.5 hp Second cycle</td>
</tr>
<tr>
<td>DD2476</td>
<td><strong>Search Engines and Information Retrieval Systems</strong></td>
<td>9.0 hp Second cycle</td>
</tr>
<tr>
<td>EN2500</td>
<td><strong>Information Theory and Source Coding</strong></td>
<td>7.5 hp Second cycle</td>
</tr>
<tr>
<td>EP2200</td>
<td><strong>Queuing Theory and Teletraffic Systems</strong></td>
<td>7.5 hp Second cycle</td>
</tr>
<tr>
<td>EQ2460</td>
<td><strong>Seminars in Wireless Systems</strong></td>
<td>3.0 hp Second cycle</td>
</tr>
<tr>
<td>EQ2840</td>
<td><strong>Information Theory and Channel Coding, Accelerated Program</strong></td>
<td>7.5 hp Second cycle</td>
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Conditionally elective courses

<table>
<thead>
<tr>
<th>Course code</th>
<th>Course name</th>
<th>Credits Edu. level</th>
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<tbody>
<tr>
<td>EP2120</td>
<td><strong>Internetworking</strong></td>
<td>7.5 hp Second cycle</td>
</tr>
<tr>
<td>EQ1220</td>
<td><strong>Signal Theory</strong></td>
<td>7.5 hp First cycle</td>
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Year 2

Optional courses

<table>
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<tr>
<th>Course code</th>
<th>Course name</th>
<th>Credits Edu. level</th>
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<tbody>
<tr>
<td>DD2429</td>
<td><strong>Computational Photography</strong></td>
<td>6.0 hp Second cycle</td>
</tr>
<tr>
<td>EN2202</td>
<td><strong>Pattern Recognition</strong></td>
<td>7.5 hp Second cycle</td>
</tr>
<tr>
<td>EN2300</td>
<td><strong>Speech Signal Processing</strong></td>
<td>6.0 hp Second cycle</td>
</tr>
<tr>
<td>EQ2300</td>
<td><strong>Digital Signal Processing</strong></td>
<td>7.5 hp Second cycle</td>
</tr>
</tbody>
</table>
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

<table>
<thead>
<tr>
<th>Course code</th>
<th>Course name</th>
<th>Credits</th>
<th>Edu. level</th>
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<tbody>
<tr>
<td>EN2401</td>
<td>Image and Video Processing</td>
<td>6.0 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>EQ2310</td>
<td>Digital Communications</td>
<td>9.0 hp</td>
<td>Second cycle</td>
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</table>

**Human Computer Interaction and Design EIT (HCID)**

**Year 1**

**Mandatory courses (30.0 Credits)**

<table>
<thead>
<tr>
<th>Course code</th>
<th>Course name</th>
<th>Credits</th>
<th>Edu. level</th>
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<tbody>
<tr>
<td>DH2408</td>
<td>Evaluation Methods in Human-Computer Interaction</td>
<td>6.0 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>DH2632</td>
<td>Human-Computer Interaction, Research Seminars</td>
<td>3.0 hp</td>
<td>Second cycle</td>
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<tr>
<td>DH2641</td>
<td>Interaction Programming</td>
<td>6.0 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>IC1007</td>
<td>Human-computer Interaction: Principles and Design</td>
<td>7.5 hp</td>
<td>First cycle</td>
</tr>
<tr>
<td>II2202</td>
<td>Research Methodology and Scientific Writing</td>
<td>7.5 hp</td>
<td>Second cycle</td>
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**Optional courses**

<table>
<thead>
<tr>
<th>Course code</th>
<th>Course name</th>
<th>Credits</th>
<th>Edu. level</th>
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<tbody>
<tr>
<td>DD2431</td>
<td>Machine Learning</td>
<td>6.0 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>DH2610</td>
<td>Theory and Methodology of Science in Human-Computer Interaction</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>DH2628</td>
<td>Interaction Design Methods</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td></td>
<td>Requires DH2629</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DH2629</td>
<td>Interaction Design as a Reflective Practice</td>
<td>7.5 hp</td>
<td>Second cycle</td>
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<tr>
<td>DT2140</td>
<td>Multimodal Interaction and Interfaces</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>IC2005</td>
<td>Methodology of Interaction Design</td>
<td>7.5 hp</td>
<td>Second cycle</td>
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<tr>
<td></td>
<td>Mandatory for students who before TIVNM took a correspondent of IC1007</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ID2209</td>
<td>Distributed Artificial Intelligence and Intelligent Agents</td>
<td>7.5 hp</td>
<td>Second cycle</td>
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**Year 2**

**Mandatory courses (22.5 Credits)**
<table>
<thead>
<tr>
<th>Course code</th>
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<th>Credits</th>
<th>Edu. level</th>
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<tbody>
<tr>
<td>DH2400</td>
<td>Physical Interaction Design and Realization</td>
<td>7.5 hp</td>
<td>Second cycle</td>
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<tr>
<td></td>
<td>Theory and Methodology of Science in Human-Computer Interaction</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DH2610</td>
<td>For Human Computer Interaction and Design Students not taken the Research Methodology and Scientific Writting year 1</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>ID2216</td>
<td>Developing Mobile Applications</td>
<td>7.5 hp</td>
<td>Second cycle</td>
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**Optional courses**

<table>
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<th>Credits</th>
<th>Edu. level</th>
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<tbody>
<tr>
<td>DH2660</td>
<td>Haptics</td>
<td>6.0 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>DT2140</td>
<td>Multimodal Interaction and Interfaces</td>
<td>7.5 hp</td>
<td>Second cycle</td>
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<tr>
<td>ID2012</td>
<td>Ubiquitous Computing</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>II2302</td>
<td>Sensor Based Systems</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>IK2555</td>
<td>Wireless and Mobile Network Architectures</td>
<td>7.5 hp</td>
<td>Second cycle</td>
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**Embedded Systems EIT (INSY)**

**Year 1**

**Mandatory courses (37.5 Credits)**

<table>
<thead>
<tr>
<th>Course code</th>
<th>Course name</th>
<th>Credits</th>
<th>Edu. level</th>
</tr>
</thead>
<tbody>
<tr>
<td>ID2202</td>
<td>Compilers and Execution Environments</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>II2202</td>
<td>Research Methodology and Scientific Writing</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>IL2206</td>
<td>Embedded Systems</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>IL2212</td>
<td>Embedded Software</td>
<td>7.5 hp</td>
<td>Second cycle</td>
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<tr>
<td>IS2202</td>
<td>Computer Systems Architecture</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
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</table>

**Year 2**

**Mandatory courses (16.5 Credits)**

<table>
<thead>
<tr>
<th>Course code</th>
<th>Course name</th>
<th>Credits</th>
<th>Edu. level</th>
</tr>
</thead>
<tbody>
<tr>
<td>IL2217</td>
<td>Digital Design with HDL</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>IL2228</td>
<td>Design Project Course I</td>
<td>9.0 hp</td>
<td>Second cycle</td>
</tr>
</tbody>
</table>

**Conditionally elective 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
<table>
<thead>
<tr>
<th>Course code</th>
<th>Course name</th>
<th>Credits</th>
<th>Edu. level</th>
</tr>
</thead>
<tbody>
<tr>
<td>EP2210</td>
<td>Performance Analysis of Communication Networks</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>EP2300</td>
<td>Management of Networks and Networked Systems</td>
<td>7.5 hp</td>
<td>Second cycle</td>
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<tr>
<td>EP2400</td>
<td>Network Algorithms</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>EP2510</td>
<td>Advanced Networked Systems Security</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>EP2520</td>
<td>Building Networked Systems Security</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>IK2206</td>
<td>Internet Security and Privacy</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
</tbody>
</table>

### 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 2013

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)