Programme syllabus

Master's Programme, ICT Innovation, 120 credits
Masterprogram, ICT Innovation
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 ICT Innovation master's programme main subjects Computer Science and Electrical Engineering. The programme aims at combining advanced technical education in information and communication technology (90.0 credits) with business-oriented courses focusing on innovation and entrepreneurship (30.0 credits).

Objectives for the business-oriented parts are a basic understanding of, as well as application of each in a stepwise 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 specialisations:

Human Computer Interaction and Design focuses on 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.

Visual computing and communication 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.

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

Data Science focuses on a wide range of advanced topics in data-intensive computing platforms, i.e., existing frameworks to store and process Big Data as well as the basics of stream processing, data analysis, data mining, and algorithms, techniques and tools for machine learning to analyze very large amounts of data.

Autonomous Systems focus on artificial intelligence (AI) in particular robotics, computer vision (image analysis), speech technology, distributed AI, machine learning and control technology, sensor networks and distributed systems.

Cloud and network infrastructures focuses on communication network design, management and operation on the one hand and cloud service and deployment models, and application design on the other. The program also addresses future directions of cloud computing, for example, in the fields of edge and fog computing as well as blockchains and distributed ledger applications.
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
- demonstrate 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
- 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 demonstrate the skills required
- demonstrate the ability to participate in research and development work or to work independently in other advanced contexts.
- demonstrate the ability to develop and design products, processes and systems with regard to people's conditions and needs and society's goals for economic, social and ecological sustainable development.

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.
- demonstrate insight into possibilities and limitations of technology, its role in society and people's responsibility for how it works and is used, including social and economic aspects as well as environmental and work environment aspects.

Extent and content of the programme

Extent: 2 years (120 credits)

Level of education: Advanced

Language of education: English

The program has a unified structure that combines 30 ECTS of "business" oriented classes (Innovation and Entrepreneurship ie I&E) with 90 ECTS with specific technical focus. The business-oriented part is fully standardized and joint across all technical specialisations.
This programme is offered in two different forms:

1. **Without mobility requirements**: two years at KTH entirely according to KTH's regulatory system and processes for admission, tuition fees, study follow-up and examination.

   - Human Computer Interaction and Design KTH (HCIN) - Year 1+2
   - Visual computing and communication KTH (VCCN) Year 1+2
   - Embedded Systems KTH (INSM) - Year 1+2
   - Data Science KTH (DASE) Year 1+2
   - Autonomous Systems KTH (AUSY) Year 1+2
   - Cloud and network infrastructures KTH (CLNI) Year 1+2

2. **With mobility requirements**: in cooperation with EIT Digital in accordance with signed agreements. This includes a mandatory geographical mobility: studies year 1 resp. year 2 at two universities in two different countries, one of which is at KTH. In addition to Swedish legislation, EIT Digitals rules and processes apply. The programme also includes a number of joint activities: i.e. Kickoff, Summer School and Graduation Ceremony. Full information is available on EIT Digital's website, www.eitdigital.eu.

   - Human Computer Interaction and Design EIT (HCID) - Year 1 alt. 2 at KTH
   - Visual computing and communication (VCCO) Year 1 alt. 2 at KTH
   - Embedded Systems EIT (INSY) - Year 1 alt. 2 at KTH
   - Data Science EIT (DASC) Year 1 alt. 2 at KTH
   - Autonomous Systems EIT (AUSM) Year 1 alt. 2 at KTH
   - Cloud and network infrastructures EIT (CLNS) Year 1 alt. 2 at KTH

**Eligibility and selection**

General admission requirements and the following special admission requirements must be fulfilled in order to be admitted: Internationally recognized 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:

- 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.

Applicants admitted to basic technical education and who have completed courses equivalent to 180 credits will be assessed on a case-by-case basis.

**Selection process**

The selection process for non-mobility students is based on the following selection criteria: university status, study result, motivation for studies, references, and work experience. The evaluation scale is 1-75. The selection process is administered by KTH.

The selection process for mobility students is based on the following criteria: university status, study results, motivation for the studies, relevant work experience, and overall CV assessment. The selection process is managed by EIT Digital.
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 first three semesters comprise courses, while the fourth semester consists of a degree project. Semester 1 and 2 mainly includes compulsory courses. Semester 3 includes compulsory and conditional elective courses according to the chosen specialisation. Business-oriented course are mandatory for both year 1 and year 2.

Mobility options

For specialisations with mobility requirements, the mobility point is after year one. One of the two years is conducted at a university other than KTH.

The following mobility options are offered:

### Human Computer Interaction and Design (HCID)

- Year 1: KTH, Aalto U., UPS, UPM, U. of Twente.
- Year 2: KTH, U. of Twente, Aalto U., UPS, TU Berlin, UNITN, UPM

### Visual Computing and communication EIT (VCCO)

- Year 1: KTH, TU Delft, Aalto U.
- Year 2: KTH, TU Delft, Aalto U, BME.

### Embedded Systems EIT (INSY) -

- Year 1: KTH, TU/e, TU Berlin
- Year 2: KTH, TU/e, Aalto U., TUCS, TU Berlin, UNITN, BME

### Data Science EIT (DASC) -

- Year 1: KTH, UNS, UPM, POLIMI, TU/e
- Year 2: KTH, UNS, Aalto, TUB, UPM, TU/e

### Autonomous Systems EIT (AUSM)

- Year 1: Aalto, KTH, TU Berlin, U Trento
- Year 2: Aalto, KTH, TU Berlin, U Trento, EURECOM, ELTE

### Cloud and network infrastructures EIT (CLNS)

- Year 1: KTH, Aalto, TUB, UR1, SU, UNITN
- Year 2: KTH, Aalto, TUB, UR1, SU, UNITN

Transition between specialisations

For specialisations without mobility requirements an opportunity for a transfer to a specialisation with mobility requirements are offered. A separate application for this should be submitted to the program management at the beginning of year 1.

The choice of specialisations with mobility requirements is binding. The reason is the special benefits that the student receives in these cases. For transfer to non-mobility requirements, a completely new application is required.

Courses

The programme is course-based. Lists of courses are included 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.

Grading scale is found in the course syllabus.

For specialisations with mobility requirements, the participating university's own grade system for the respective academic year are used. Conversion of grades is done using conversion tables determined in agreement.

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. The project work may begin when special admission requirements for the course are fulfilled.

For students with mobility requirements the degree project should be substantively well-founded in industrially relevant problems and an industrial environment.

Degree project is carried out at KTH for all students who study the second year at KTH. For students with mobility requirements and who study the second year on a different university than KTH, that university rules and policies applies.

Degree

The degree is entitled “Teknologie masterexamen” - Master of Science (120 credits). The main field of study is stated in the text on the degree certificate. The text on the degree certificate states the educational programme, ICT Innovation, completed by the student.

For specialisations with mobility requirements, students graduated from the programme have the opportunity to obtain dual degrees from the KTH and the exchange university to which the student has been admitted. The application for the degree for the latter university must be done separately. The dual examinations can be supplemented with an EIT Label Certificate documenting the fulfilment of EIT’s specific learning goals.

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 2019

### General courses

#### Year 1

**Mandatory courses (19.0 credits)**

<table>
<thead>
<tr>
<th>Course code</th>
<th>Course name</th>
<th>Credits</th>
<th>Edu. level</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME2072</td>
<td>Entrepreneurship for Engineers</td>
<td>6.0</td>
<td>Second cycle</td>
</tr>
<tr>
<td>ME2073</td>
<td>Business Development Lab of Entrepreneurship Engineers</td>
<td>9.0</td>
<td>Second cycle</td>
</tr>
<tr>
<td>ME2078</td>
<td>Summer Course- Entrepreneurship for Engineers</td>
<td>4.0</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>AK2036</td>
<td>Theory and Methodology of Science with Applications (Natural and Technological Science) One of AK2036 or II2202 shall be choosen</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>II2202</td>
<td>Research Methodology and Scientific Writing One of II2202 or AK2036 shall be choosen</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>ME2062</td>
<td>Technology-based Entrepreneurship One of ME2062, ME2094, ME2095 shall be choosen</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>ME2094</td>
<td>Internet Marketing One of ME2062, ME2094, ME2095 shall be choosen</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>ME2095</td>
<td>e-Business Strategies One of ME2062, ME2094, ME2095 shall be choosen</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
</tbody>
</table>

#### Year 2

**Mandatory courses (6.0 credits)**

<table>
<thead>
<tr>
<th>Course code</th>
<th>Course name</th>
<th>Credits</th>
<th>Edu. level</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME2096</td>
<td>ICT Innovation Study Project</td>
<td>6.0</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>
</table>
| AK2036      | Theory and Methodology of Science with Applications (Natural and Technological Science)  
*One of II2202, AK2036 shall be choosen* | 7.5     | Second cycle |
| II2202      | Research Methodology and Scientific Writing  
*One of II2202, AK2036 shall be choosen* | 7.5     | Second cycle |

### Supplementary information

Degree project 30 credits advanced level is mandatory during the spring term.

In accordance with KTH's regulations, a mandatory course in Research Methodology and Scientific Writing 7.5 credits needs to be included. This course can be taken anytime during the studies. Currently, the following courses are offered:

- II2202 Research Methodology and Scientific Writing 7.5 credits
- AK2036 Theory and Methodology of Science with Applications (Natural and Technological Science 7.5 credits)

### Autonomous Systems EIT (AUSM)

### Year 1

#### Mandatory courses (41.5 credits)

<table>
<thead>
<tr>
<th>Course code</th>
<th>Course name</th>
<th>Credits</th>
<th>Edu. level</th>
</tr>
</thead>
<tbody>
<tr>
<td>DD2410</td>
<td>Introduction to Robotics</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>DD2421</td>
<td>Machine Learning</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>ID2209</td>
<td>Distributed Artificial Intelligence and Intelligent Agents</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>ME2072</td>
<td>Entrepreneurship for Engineers</td>
<td>6.0</td>
<td>Second cycle</td>
</tr>
<tr>
<td>ME2073</td>
<td>Business Development Lab of Entrepreneurship Engineers</td>
<td>9.0</td>
<td>Second cycle</td>
</tr>
<tr>
<td>ME2078</td>
<td>Summer Course- Entrepreneurship for Engineers</td>
<td>4.0</td>
<td>Second cycle</td>
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</tbody>
</table>

#### Optional courses

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>DD2380</td>
<td>Artificial Intelligence</td>
<td>6.0</td>
<td>Second cycle</td>
</tr>
<tr>
<td>DD2423</td>
<td>Image Analysis and Computer Vision</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>DD2424</td>
<td>Deep Learning in Data Science</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>EL1010</td>
<td>Automatic Control, General Course</td>
<td>6.0</td>
<td>First cycle</td>
</tr>
<tr>
<td>EL2450</td>
<td>Hybrid and Embedded Control Systems</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>EL2520</td>
<td>Control Theory and Practice, Advanced Course</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>Course code</td>
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</tr>
<tr>
<td>EQ2321</td>
<td>Speech and Audio Processing</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>EQ2341</td>
<td>Pattern Recognition and Machine Learning</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>EQ2425</td>
<td>Analysis and Search of Visual Data</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>EQ2871</td>
<td>Cyber-Physical Networking</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>II2302</td>
<td>Sensor Based Systems</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>IL2206</td>
<td>Embedded Systems</td>
<td>7.5</td>
<td>Second cycle</td>
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**Conditionally elective courses**

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<tr>
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<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>
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One of II2202, AK2036 shall be choosen

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<tr>
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<tbody>
<tr>
<td>II2202</td>
<td>Research Methodology and Scientific Writing</td>
<td>7.5</td>
<td>Second cycle</td>
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One of II2202, AK2036 shall be choosen

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<tbody>
<tr>
<td>ME2062</td>
<td>Technology-based Entrepreneurship</td>
<td>7.5</td>
<td>Second cycle</td>
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One of ME2062, ME2094, ME2095 shall be choosen

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<tbody>
<tr>
<td>ME2094</td>
<td>Internet Marketing</td>
<td>7.5</td>
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<tr>
<td>ME2095</td>
<td>e-Business Strategies</td>
<td>7.5</td>
<td>Second cycle</td>
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One of ME2062, ME2094, ME2095 shall be choosen

**Year 2**

**Mandatory courses (6.0 credits)**

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>ME2096</td>
<td>ICT Innovation Study Project</td>
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**Optional courses**

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<tr>
<td>DD2380</td>
<td>Artificial Intelligence</td>
<td>6.0</td>
<td>Second cycle</td>
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<tr>
<td>EL2320</td>
<td>Applied Estimation</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>EL2820</td>
<td>Modelling of Dynamical Systems</td>
<td>7.5</td>
<td>Second cycle</td>
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<tr>
<td>ID2209</td>
<td>Distributed Artificial Intelligence and Intelligent Agents</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>ID2223</td>
<td>Scalable Machine Learning and Deep Learning</td>
<td>7.5</td>
<td>Second cycle</td>
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### Conditionally elective courses

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<tbody>
<tr>
<td>IL2206</td>
<td>Embedded Systems</td>
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**Supplementary information**

Degree project 30 credits advanced level is mandatory during the spring term.

In accordance with KTH's regulations, a mandatory course in Research Methodology and Scientific Writing 7.5 credits needs to be included. This course can be taken anytime during the studies. Currently, the following courses are offered:

- II2202: Research Methodology and Scientific Writing 7.5 credits
- AK2036: Theory and Methodology of Science with Applications (Natural and Technological Science) 7.5 credits

### Autonomous Systems KTH (AUSY)

#### Year 1

**Mandatory courses (41.5 credits)**

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<td>ME2072</td>
<td>Entrepreneurship for Engineers</td>
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<td>ME2073</td>
<td>Business Development Lab of Entrepreneurship Engineers</td>
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<tr>
<td>DD2423</td>
<td>Image Analysis and Computer Vision</td>
<td>7.5</td>
<td>Second cycle</td>
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<tr>
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<td>Deep Learning in Data Science</td>
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<td>EL2450</td>
<td>Hybrid and Embedded Control Systems</td>
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<td>Second cycle</td>
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<td>Speech and Audio Processing</td>
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<td>II2302</td>
<td>Sensor Based Systems</td>
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<tr>
<td>IL2206</td>
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**Conditionally elective courses**

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<th>Credits</th>
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<tbody>
<tr>
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<td>Theory and Methodology of Science with Applications (Natural and Technological Science)</td>
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One of II2202, AK2036 shall be choosen

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One of II2202, AK2036 shall be choosen

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One of ME2062, ME2094, ME2095 shall be choosen

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<td>Internet Marketing</td>
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<td>e-Business Strategies</td>
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One of ME2062, ME2094, ME2095 shall be choosen

**Year 2**

**Mandatory courses (6.0 credits)**

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Optional courses

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<td>EL2320</td>
<td>Applied Estimation</td>
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<td>EL2820</td>
<td>Modelling of Dynamical Systems</td>
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<td>Distributed Artificial Intelligence and Intelligent Agents</td>
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<td>Second cycle</td>
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<td>ID2223</td>
<td>Scalable Machine Learning and Deep Learning</td>
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<td>Second cycle</td>
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<td>IL2206</td>
<td>Embedded Systems</td>
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Conditionally elective courses

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<tr>
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<td>Second cycle</td>
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<tr>
<td></td>
<td><em>One of II2202, AK2036 shall be chosen</em></td>
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<tr>
<td>II2202</td>
<td>Research Methodology and Scientific Writing</td>
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<td>Second cycle</td>
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<td></td>
<td><em>One of II2202, AK2036 shall be chosen</em></td>
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</table>

Supplementary information

Degree project 30 credits advanced level is mandatory during the spring term.

In accordance with KTH's regulations, a mandatory course in Research Methodology and Scientific Writing 7.5 credits needs to be included. This course can be taken anytime during the studies. Currently, the following courses are offered:

- II2202 Research Methodology and Scientific Writing 7.5 credits
- AK2036 Theory and Methodology of Science with Applications (Natural and Technological Science 7.5 credits

Year 3

Cloud and Network infrastructures KTH (CLNI)

Year 1

Mandatory courses (34.0 credits)

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<thead>
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<th>Course name</th>
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<td>Data-Intensive Computing</td>
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<td>IK2215</td>
<td>Advanced Internetworking</td>
<td>7.5</td>
<td>Second cycle</td>
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<tr>
<td>ME2072</td>
<td>Entrepreneurship for Engineers</td>
<td>6.0</td>
<td>Second cycle</td>
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<td>ME2073</td>
<td>Business Development Lab of Entrepreneurship Engineers</td>
<td>9.0</td>
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<td>ME2078</td>
<td>Summer Course- Entrepreneurship for Engineers</td>
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### Optional courses

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<tr>
<td>EP2200</td>
<td>Queuing Theory and Teletraffic Systems</td>
<td>7.5</td>
<td>Second cycle</td>
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<td>ID2203</td>
<td>Distributed Systems, Advanced Course</td>
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<td>ID2210</td>
<td>Distributed Computing, Peer-to-Peer and GRIDS</td>
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### Conditionally elective courses

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<th>Credits</th>
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<tr>
<td>EP2950</td>
<td>Wireless Networks</td>
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<td>Research Methodology and Scientific Writing One of II2202, AK2036 shall be choosen</td>
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<td>IK2200</td>
<td>Communication System Design</td>
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<td>Technology-based Entrepreneurship</td>
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<td>Second cycle</td>
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<tr>
<td>ME2094</td>
<td>Internet Marketing</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
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<td>ME2095</td>
<td>e-Business Strategies</td>
<td>7.5</td>
<td>Second cycle</td>
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### Year 2

#### Mandatory courses (6.0 credits)

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<tbody>
<tr>
<td>ME2096</td>
<td>ICT Innovation Study Project</td>
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#### Optional courses

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<thead>
<tr>
<th>Course code</th>
<th>Course name</th>
<th>Credits</th>
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<tbody>
<tr>
<td>EP2300</td>
<td>Management of Networks and Networked Systems</td>
<td>7.5</td>
<td>Second cycle</td>
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<td>EP2420</td>
<td>Network Analytics</td>
<td>7.5</td>
<td>Second cycle</td>
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<td>EP2500</td>
<td>Networked Systems Security</td>
<td>7.5</td>
<td>Second cycle</td>
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<tr>
<td>ID2207</td>
<td>Modern Methods in Software Engineering</td>
<td>7.5</td>
<td>Second cycle</td>
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<td>ID2208</td>
<td>Programming Web-Services</td>
<td>7.5</td>
<td>Second cycle</td>
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<td>ID2209</td>
<td>Distributed Artificial Intelligence and Intelligent Agents</td>
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<td>Second cycle</td>
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<td>Course code</td>
<td>Course name</td>
<td>Credits</td>
<td>Edu. level</td>
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<td>Data Mining</td>
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<td>ID2223</td>
<td>Scalable Machine Learning and Deep Learning</td>
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<td>Second cycle</td>
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<tr>
<td>IK2206</td>
<td>Internet Security and Privacy</td>
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<tbody>
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<tr>
<td>II2202</td>
<td>Research Methodology and Scientific Writing</td>
<td>7.5</td>
<td>Second cycle</td>
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</tbody>
</table>

**Supplementary information**

Degree project 30 credits advanced level is mandatory during the spring term.

In accordance with KTH's regulations, a mandatory course in Research Methodology and Scientific Writing 7.5 credits needs to be included. This course can be taken anytime during the studies. Currently, the following courses are offered:

- II2202 Research Methodology and Scientific Writing 7.5 credits
- AK2036 Theory and Methodology of Science with Applications (Natural and Technological Science 7.5 credits

IL2450 and IL2217 will be replaced by a new course from HT19, VHDL design and validation (name can be changed), 9 credits.

**Cloud and Network infrastructures (CLNS)**

**Year 1**

**Mandatory courses (34.0 credits)**

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<td>Business Development Lab of Entrepreneurship Engineers</td>
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<td>ME2078</td>
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Optional courses

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<tr>
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<td>Theory and Methodology of Science with Applications (Natural and Technological Science) &lt;br&gt; One of II2202, AK2036 shall be choosen</td>
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<td>EP2950</td>
<td>Wireless Networks</td>
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<td>Second cycle</td>
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<tr>
<td>II2202</td>
<td>Research Methodology and Scientific Writing &lt;br&gt; One of II2202, AK2036 shall be choosen</td>
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<td>IK2200</td>
<td>Communication System Design</td>
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<td>ME2062</td>
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Year 2

Mandatory courses (6.0 credits)

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<td>Programming Web-Services</td>
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### Course code

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<td>ID2223</td>
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<td>IK2206</td>
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#### Conditionally elective courses

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<tr>
<td>AK2036</td>
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<td>II2202</td>
<td>Research Methodology and Scientific Writing</td>
<td>7.5</td>
<td>Second cycle</td>
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</table>

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### Data Science EIT (DASC)

#### Year 1

**Mandatory courses (41.5 credits)**

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<td>Data Mining, Basic Course</td>
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<td>ID2214</td>
<td>Programming for Data Science</td>
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<td>Second cycle</td>
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<td>ME2072</td>
<td>Entrepreneurship for Engineers</td>
<td>6.0</td>
<td>Second cycle</td>
</tr>
<tr>
<td>ME2073</td>
<td>Business Development Lab of Entrepreneurship Engineers</td>
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<th>Course name</th>
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<td>Visualization</td>
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<td>Image Analysis and Computer Vision</td>
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<td>Deep Learning in Data Science</td>
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<td>DD2437</td>
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<td>DD2447</td>
<td>Statistical Methods in Applied Computer Science</td>
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<td>Search Engines and Information Retrieval Systems</td>
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<td>ID2203</td>
<td>Distributed Systems, Advanced Course</td>
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<td>Second cycle</td>
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<td>ID2210</td>
<td>Distributed Computing, Peer-to-Peer and GRIDS</td>
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### Conditionally elective courses

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<td>II2202</td>
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<td>ME2062</td>
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<td>ME2094</td>
<td>Internet Marketing One of ME2062, ME2094, ME2095 shall be choosen</td>
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<tr>
<td>ME2095</td>
<td>e-Business Strategies One of ME2062, ME2094, ME2095 shall be choosen</td>
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### Year 2

#### Mandatory courses (21.0 credits)

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<tr>
<th>Course code</th>
<th>Course name</th>
<th>Credits</th>
<th>Edu. level</th>
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<tbody>
<tr>
<td>ID2221</td>
<td>Data-Intensive Computing</td>
<td>7.5</td>
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</tr>
<tr>
<td>ID2222</td>
<td>Data Mining</td>
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<td>Second cycle</td>
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<tr>
<td>Course code</td>
<td>Course name</td>
<td>Credits</td>
<td>Edu. level</td>
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<tr>
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<td>ICT Innovation Study Project</td>
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Optional courses

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<td>DD2418</td>
<td>Language Engineering</td>
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<tr>
<td>DD2423</td>
<td>Image Analysis and Computer Vision</td>
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<td>Second</td>
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<tr>
<td>ID2223</td>
<td>Scalable Machine Learning and Deep Learning</td>
<td>7.5</td>
<td>Second</td>
</tr>
<tr>
<td>ID2225</td>
<td>Learning Machines</td>
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<td>Second</td>
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<th>Course code</th>
<th>Course name</th>
<th>Credits</th>
<th>Edu. level</th>
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<td></td>
<td>Technological Science)</td>
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<td>II2202</td>
<td>Research Methodology and Scientific Writing</td>
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<td></td>
<td>One of II2202, AK2036 shall be choosen</td>
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</table>

Supplementary information

Degree project 30 credits advanced level is mandatory during the spring term.

In accordance with KTH’s regulations, a mandatory course in Research Methodology and Scientific Writing 7.5 credits needs to be included. This course can be taken anytime during the studies. Currently, the following courses are offered:

- II2202 Research Methodology and Scientific Writing 7.5 credits
- AK2036 Theory and Methodology of Science with Applications (Natural and Technological Science 7.5 credits

Year 3

Data Science KTH (DASE)

Year 1

Mandatory courses (41.5 credits)

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<thead>
<tr>
<th>Course code</th>
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<td>ID2214</td>
<td>Programming for Data Science</td>
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<td>ME2072</td>
<td>Entrepreneurship for Engineers</td>
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<td>ME2073</td>
<td>Business Development Lab of Entrepreneurship Engineers</td>
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</tr>
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<td>Summer Course- Entrepreneurship for Engineers</td>
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**Optional courses**

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<tr>
<th>Course code</th>
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<td>Language Engineering</td>
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<td>DD2423</td>
<td>Image Analysis and Computer Vision</td>
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<td>Statistical Methods in Applied Computer Science</td>
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<td>Search Engines and Information Retrieval Systems</td>
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**Conditionally elective courses**

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<td>One of II2202, AK2036 shall be choosen</td>
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<td>Research Methodology and Scientific Writing</td>
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<tr>
<td>ID2221</td>
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<td>ID2222</td>
<td>Data Mining</td>
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<td>Second cycle</td>
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<td>ICT Innovation Study Project</td>
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<td>Image Analysis and Computer Vision</td>
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<tbody>
<tr>
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One of II2202, AK2036 shall be choosen

<table>
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<tbody>
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</table>

One of II2202, AK2036 shall be choosen

**Supplementary information**

Degree project 30 credits advanced level is mandatory during the spring term.

In accordance with KTH's regulations, a mandatory course in Research Methodology and Scientific Writing 7.5 credits needs to be included. This course can be taken anytime during the studies. Currently, the following courses are offered:

- II2202 Research Methodology and Scientific Writing 7.5 credits
- AK2036 Theory and Methodology of Science with Applications (Natural and Technological Science 7.5 credits)
Human Computer Interaction and Design EIT (HCID)

Year 1

Mandatory courses (44.5 credits)

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<thead>
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<th>Course code</th>
<th>Course name</th>
<th>Credits</th>
<th>Edu. level</th>
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<td>3.0</td>
<td>Second cycle</td>
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<tr>
<td>DH2642</td>
<td>Interaction Programming and the Dynamic Web</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>IC1007</td>
<td>Human-computer Interaction: Principles and Design</td>
<td>7.5</td>
<td>First cycle</td>
</tr>
<tr>
<td>IC2005</td>
<td>Methodology of Interaction Design</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>ME2072</td>
<td>Entrepreneurship for Engineers</td>
<td>6.0</td>
<td>Second cycle</td>
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<tr>
<td>ME2073</td>
<td>Business Development Lab of Entrepreneurship Engineers</td>
<td>9.0</td>
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<tr>
<td>ME2078</td>
<td>Summer Course- Entrepreneurship for Engineers</td>
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Optional courses

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<td>DH2408</td>
<td>Evaluation Methods in Human-Computer Interaction</td>
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<td>Second cycle</td>
</tr>
<tr>
<td>DH2670</td>
<td>Haptics, Tactile and Tangible Interaction</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>DT2140</td>
<td>Multimodal Interaction and Interfaces</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>ID2209</td>
<td>Distributed Artificial Intelligence and Intelligent Agents</td>
<td>7.5</td>
<td>Second cycle</td>
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Conditionally elective courses

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<tbody>
<tr>
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<td>Theory and Methodology of Science with Applications (Natural and</td>
<td>7.5</td>
<td>Second cycle</td>
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</table>
|             | Technological Science)  
|             | One of II2202, AK2036 shall be choosen                           |         |              |
| II2202      | Research Methodology and Scientific Writing                      | 7.5     | Second cycle |
|             | One of II2202, AK2036 shall be choosen                           |         |              |
| ME2062      | Technology-based Entrepreneurship                                | 7.5     | Second cycle |
|             | One of ME2062, ME2094, ME2095 shall be choosen                   |         |              |
| ME2094      | Internet Marketing                                               | 7.5     | Second cycle |
|             | One of ME2062, ME2094, ME2095 shall be choosen                   |         |              |
| ME2095      | e-Business Strategies                                            | 7.5     | Second cycle |
|             | One of ME2062, ME2094, ME2095 shall be choosen                   |         |              |
### Year 2

#### Mandatory courses (21.0 credits)

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<td>Developing Mobile Applications</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>ME2096</td>
<td>ICT Innovation Study Project</td>
<td>6.0</td>
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#### Optional courses

<table>
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<tr>
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<th>Credits</th>
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<tbody>
<tr>
<td>DH2670</td>
<td>Haptics, Tactile and Tangible Interaction</td>
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<td>Second cycle</td>
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<td>DT2140</td>
<td>Multimodal Interaction and Interfaces</td>
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<td>Ubiquitous Computing</td>
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<td>Sensor Based Systems</td>
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<td>IK2560</td>
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<tr>
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<th>Credits</th>
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<tbody>
<tr>
<td>AK2036</td>
<td>Theory and Methodology of Science with Applications (Natural and Technological Science)</td>
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</table>

One of II2202, AK2036 shall be chosen

<table>
<thead>
<tr>
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<tbody>
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<td>II2202</td>
<td>Research Methodology and Scientific Writing</td>
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One of II2202, AK2036 shall be chosen

#### Supplementary information

Degree project 30 credits advanced level is mandatory during the spring term.

In accordance with KTH's regulations, a mandatory course in Research Methodology and Scientific Writing 7.5 credits needs to be included. This course can be taken anytime during the studies. Currently, the following courses are offered:

- II2202 Research Methodology and Scientific Writing 7.5 credits
- AK2036 Theory and Methodology of Science with Applications (Natural and Technological Science 7.5 credits)
### Year 3

#### Human Computer Interaction and Design KTH (HCIN)

### Year 1

**Mandatory courses (44.5 credits)**

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<tbody>
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**Conditionally elective courses**

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<tr>
<th>Course code</th>
<th>Course name</th>
<th>Credits</th>
<th>Edu. level</th>
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</table>
| AK2036      | Theory and Methodology of Science with Applications (Natural and Technological Science)  
*One of II2202, AK2036 shall be choosen* | 7.5     | Second cycle |
| II2202      | Research Methodology and Scientific Writing                               
*One of II2202, AK2036 shall be choosen* | 7.5     | Second cycle |
| ME2062      | Technology-based Entrepreneurship                                         
*One of ME2062, ME2094, ME2095 shall be choosen* | 7.5     | Second cycle |
| ME2094      | Internet Marketing                                                        
*One of ME2062, ME2094, ME2095 shall be choosen* | 7.5     | Second cycle |
| ME2095      | e-Business Strategies                                                    | 7.5     | Second cycle |
### Year 2

**Mandatory courses (21.0 credits)**

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<td>DT2140</td>
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<tr>
<td>ID2012</td>
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<tr>
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<tr>
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**Conditionally elective courses**

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<tr>
<td>II2202</td>
<td>Research Methodology and Scientific Writing One of II2202, AK2036 shall be choosen</td>
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### Supplementary information

Degree project 30 credits advanced level is mandatory during the spring term.

In accordance with KTH’s regulations, a mandatory course in Research Methodology and Scientific Writing 7.5 credits needs to be included. This course can be taken anytime during the studies. Currently, the following courses are offered:

- II2202 Research Methodology and Scientific Writing 7.5 credits
- AK2036 Theory and Methodology of Science with Applications (Natural and Technological Science 7.5 credits)
Year 3

Embedded Systems KTH (INSM)

Year 1

Mandatory courses (49.0 credits)

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<td>Embedded Systems</td>
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<td>Computer Systems Architecture</td>
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<td>Second cycle</td>
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</tr>
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<td>ME2073</td>
<td>Business Development Lab of Entrepreneurship Engineers</td>
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</tr>
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<td>ME2078</td>
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Conditionally elective courses

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<td>II2202</td>
<td>Research Methodology and Scientific Writing</td>
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<td>Second cycle</td>
</tr>
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<td>ME2062</td>
<td>Technology-based Entrepreneurship</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>ME2094</td>
<td>Internet Marketing</td>
<td>7.5</td>
<td>Second cycle</td>
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<td>ME2095</td>
<td>e-Business Strategies</td>
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Year 2

Mandatory courses (13.5 credits)

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### Optional courses

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<td>Sensor Based Systems</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>IL2225</td>
<td>Embedded Hardware Design in ASIC and FPGA</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
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<td>IL2236</td>
<td>Embedded Many-Core Architectures</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>IL2452</td>
<td>System Design Languages</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>IS2500</td>
<td>RFID Systems</td>
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<td>Second cycle</td>
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### Conditionally elective courses

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<th>Course name</th>
<th>Credits</th>
<th>Edu. level</th>
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<td>One of II2202, AK2036 shall be choosen</td>
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</tr>
<tr>
<td></td>
<td>One of II2202, AK2036 shall be choosen</td>
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</tr>
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</table>

### Supplementary information

Degree project 30 credits advanced level is mandatory during the spring term. In accordance with KTH's regulations, a mandatory course in Research Methodology and Scientific Writing 7,5 credits needs to be included. This course can be taken anytime during the studies. Currently, the following courses are offered:

- II2202 Research Methodology and Scientific Writing 7,5 credits
- AK2036 Theory and Methodology of Science with Applications (Natural and Technological Science 7,5 credits

IL2450 and IL2217 will be replaced by a new course from HT19, VHDL design and validation (name can be changed), 9 credits.

### Year 3

**Embedded Systems EIT (INSY)**

### Year 1

**Mandatory courses (49.0 credits)**

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<thead>
<tr>
<th>Course code</th>
<th>Course name</th>
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<tr>
<td>ID2202</td>
<td>Compilers and Execution Environments</td>
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<td>Second cycle</td>
</tr>
<tr>
<td>IL2206</td>
<td>Embedded Systems</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>IL2212</td>
<td>Embedded Software</td>
<td>7.5</td>
<td>Second cycle</td>
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<tr>
<td>Course code</td>
<td>Course name</td>
<td>Credits</td>
<td>Edu. level</td>
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</tr>
<tr>
<td>IS2202</td>
<td>Computer Systems Architecture</td>
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<td>Second cycle</td>
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<tr>
<td>ME2072</td>
<td>Entrepreneurship for Engineers</td>
<td>6.0</td>
<td>Second cycle</td>
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<td>ME2073</td>
<td>Business Development Lab of Entrepreneurship Engineers</td>
<td>9.0</td>
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<tr>
<td>ME2078</td>
<td>Summer Course- Entrepreneurship for Engineers</td>
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### Conditionally elective courses

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<thead>
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<th>Course name</th>
<th>Credits</th>
<th>Edu. level</th>
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</thead>
<tbody>
<tr>
<td>AK2036</td>
<td>Theory and Methodology of Science with Applications (Natural and Technological Science)</td>
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<td>ID2218</td>
<td>Design of Fault-tolerant Systems</td>
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<td>II2202</td>
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<td>II2302</td>
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<td>IL2217</td>
<td>Digital Design with HDL</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>IL2225</td>
<td>Embedded Hardware Design in ASIC and FPGA</td>
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<td>IL2237</td>
<td>Electronic Systems Design</td>
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<td>IL2238</td>
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<td>Second cycle</td>
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<tr>
<td>ME2094</td>
<td>Internet Marketing</td>
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<td>Second cycle</td>
</tr>
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<td>ME2095</td>
<td>e-Business Strategies</td>
<td>7.5</td>
<td>Second cycle</td>
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</table>

**Supplementary information**

Students going to exits Aalto, TU Berlin, TU Eindhoven do only have mandatory courses in year 1. Other exits can chose more freely.
Course change from HT19:

- IL2450 and IL2217 will be replaced by a new course from HT19, VHDL design and validation (name can be changed), 9 credits.

**Year 2**

**Mandatory courses (13.5 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>IL2217</td>
<td>Digital Design with HDL</td>
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</tr>
<tr>
<td></td>
<td><em>Students that have studied VHDL before, can apply for replacing this course with an elective one instead</em></td>
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<td></td>
</tr>
<tr>
<td>ME2096</td>
<td>ICT Innovation Study Project</td>
<td>6.0</td>
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**Optional courses**

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<th>Course code</th>
<th>Course name</th>
<th>Credits</th>
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<tbody>
<tr>
<td>II2300</td>
<td>Product Realization Processes I</td>
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<td>II2302</td>
<td>Sensor Based Systems</td>
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<td>Second cycle</td>
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<tr>
<td>IL2225</td>
<td>Embedded Hardware Design in ASIC and FPGA</td>
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<td>Second cycle</td>
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<td>IL2236</td>
<td>Embedded Many-Core Architectures</td>
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<td>IL2452</td>
<td>System Design Languages</td>
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<td>IS2500</td>
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**Conditionally elective courses**

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<td>II2202</td>
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<td>Second cycle</td>
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<td><em>One of II2202, AK2036 shall be choosen</em></td>
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**Supplementary information**

Degree project 30 credits advanced level is mandatory during the spring term.

In accordance with KTH's regulations, a mandatory course in Research Methodology and Scientific Writing 7.5 credits needs to be included. This course can be taken anytime during the studies. Currently, the following courses are offered:

- II2202 Research Methodology and Scientific Writing 7.5 credits
- AK2036 Theory and Methodology of Science with Applications (Natural and Technological Science 7.5 credits
# Year 3

**Visual Computing and Communication KTH (VCCN)**

## Year 1

### Mandatory courses (25.0 credits)

<table>
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<td>Introduction to Visualization and Computer Graphics</td>
<td>6.0</td>
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<td>ME2072</td>
<td>Entrepreneurship for Engineers</td>
<td>6.0</td>
<td>Second cycle</td>
</tr>
<tr>
<td>ME2073</td>
<td>Business Development Lab of Entrepreneurship Engineers</td>
<td>9.0</td>
<td>Second cycle</td>
</tr>
<tr>
<td>ME2078</td>
<td>Summer Course- Entrepreneurship for Engineers</td>
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### Optional courses

<table>
<thead>
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<th>Course name</th>
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<td>DD2423</td>
<td>Image Analysis and Computer Vision</td>
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<td>Search Engines and Information Retrieval Systems</td>
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<td>Computer Graphics and Interaction</td>
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<td>Pattern Recognition and Machine Learning</td>
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<td>Second cycle</td>
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<tr>
<td>EQ2425</td>
<td>Analysis and Search of Visual Data</td>
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<td>Second cycle</td>
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<tr>
<td>EQ2461</td>
<td>Seminars in Information and Network Engineering</td>
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<td>EQ2845</td>
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### Conditionally elective courses

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</table>
### Study Programme for Master's Programme, ICT Innovation, 120 credits batch autumn 19.

#### Appendix 1, page 24 of 27

<table>
<thead>
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<th>Course name</th>
<th>Credits</th>
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</tr>
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<tbody>
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<td>Second cycle</td>
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<td>ME2062</td>
<td>Technology-based Entrepreneurship</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>ME2094</td>
<td>Internet Marketing</td>
<td>7.5</td>
<td>Second cycle</td>
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<td>ME2095</td>
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<td>7.5</td>
<td>Second cycle</td>
</tr>
</tbody>
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**Year 2**

#### Mandatory courses (13.5 credits)

<table>
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<th>Course name</th>
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<td>ME2096</td>
<td>ICT Innovation Study Project</td>
<td>6.0</td>
<td>Second cycle</td>
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#### Optional courses

<table>
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<td>Second cycle</td>
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<td>EQ2300</td>
<td>Digital Signal Processing</td>
<td>7.5</td>
<td>Second cycle</td>
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<td>EQ2310</td>
<td>Digital Communications</td>
<td>9.0</td>
<td>Second cycle</td>
</tr>
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<td>EQ2321</td>
<td>Speech and Audio Processing</td>
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<td>Second cycle</td>
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<td>EQ2401</td>
<td>Adaptive Signal Processing</td>
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<td>Second cycle</td>
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<td>Advanced Digital Communications</td>
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<td>Second cycle</td>
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<td>Machine Learning and Data Science</td>
<td>7.5</td>
<td>Second cycle</td>
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<tr>
<td>EQ2425</td>
<td>Analysis and Search of Visual Data</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>EQ2461</td>
<td>Seminars in Information and Network Engineering</td>
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<td>Second cycle</td>
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<th>Credits</th>
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<td>Theory and Methodology of Science with Applications (Natural and Technical Science)</td>
<td>7.5</td>
<td>Second cycle</td>
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<tr>
<td>II2202</td>
<td>Research Methodology and Scientific Writing</td>
<td>7.5</td>
<td>Second cycle</td>
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</table>
One of II2202, AK2036 shall be choosen

Supplementary information

Degree project 30 credits advanced level is mandatory during the spring term.

In accordance with KTH's regulations, a mandatory course in Research Methodology and Scientific Writing 7.5 credits needs to be included. This course can be taken anytime during the studies. Currently, the following courses are offered:

- II2202 Research Methodology and Scientific Writing 7.5 credits
- AK2036 Theory and Methodology of Science with Applications (Natural and Technological Science 7.5 credits)

Visual Computing and Communication EIT (VCCO)

Year 1

Mandatory courses (25.0 credits)

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<th>Credits</th>
<th>Edu. level</th>
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<td>Introduction to Visualization and Computer Graphics</td>
<td>6.0</td>
<td>Second cycle</td>
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<tr>
<td>ME2072</td>
<td>Entrepreneurship for Engineers</td>
<td>6.0</td>
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<tr>
<td>ME2073</td>
<td>Business Development Lab of Entrepreneurship Engineers</td>
<td>9.0</td>
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<td>ME2078</td>
<td>Summer Course- Entrepreneurship for Engineers</td>
<td>4.0</td>
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Optional courses

<table>
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<th>Credits</th>
<th>Edu. level</th>
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<tr>
<td>DD2257</td>
<td>Visualization</td>
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<td>DD2423</td>
<td>Image Analysis and Computer Vision</td>
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<td>DD2476</td>
<td>Search Engines and Information Retrieval Systems</td>
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<td>DH2323</td>
<td>Computer Graphics and Interaction</td>
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<tr>
<td>EP2200</td>
<td>Queuing Theory and Teletraffic Systems</td>
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<td>Second cycle</td>
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<tr>
<td>EQ2341</td>
<td>Pattern Recognition and Machine Learning</td>
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<tr>
<td>EQ2425</td>
<td>Analysis and Search of Visual Data</td>
<td>7.5</td>
<td>Second cycle</td>
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<td>EQ2461</td>
<td>Seminars in Information and Network Engineering</td>
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</tr>
<tr>
<td>EQ2845</td>
<td>Information Theory and Source Coding</td>
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### Conditionally elective courses

<table>
<thead>
<tr>
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<th>Course name</th>
<th>Credits</th>
<th>Edu. level</th>
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<tbody>
<tr>
<td>AK2036</td>
<td>Theory and Methodology of Science with Applications (Natural and Technological Science)</td>
<td>7.5</td>
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<td>EP2120</td>
<td>Internetworking</td>
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<td>EQ1220</td>
<td>Signal Theory</td>
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<td>ID2208</td>
<td>Programming Web-Services</td>
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<td>Second cycle</td>
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<td><em>Mandatory for students with exit Aalto. Elective for others.</em></td>
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<td>II2202</td>
<td>Research Methodology and Scientific Writing</td>
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<td>Second cycle</td>
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<td>ME2062</td>
<td>Technology-based Entrepreneurship</td>
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<td>Second cycle</td>
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<td>ME2094</td>
<td>Internet Marketing</td>
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<td><em>One of ME2062, ME2094, ME2095 shall be choosen</em></td>
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<td>ME2095</td>
<td>e-Business Strategies</td>
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<td>Second cycle</td>
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<td><em>One of ME2062, ME2094, ME2095 shall be choosen</em></td>
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</table>

### Supplementary information

Visual computing and communication focuses on communications systems design, modern network respectively. Internet technology, mobile and wireless technologies, properties of complex communications systems and user aspects.

### Year 2

#### Mandatory courses (13.5 credits)

<table>
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<tr>
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<th>Course name</th>
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<tbody>
<tr>
<td>EQ2330</td>
<td>Image and Video Processing</td>
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<tr>
<td>ME2096</td>
<td>ICT Innovation Study Project</td>
<td>6.0</td>
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**Optional courses**

<table>
<thead>
<tr>
<th>Course code</th>
<th>Course name</th>
<th>Credits</th>
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<tbody>
<tr>
<td>DD2429</td>
<td>Computational Photography</td>
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<td>Second cycle</td>
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<tr>
<td>EQ2300</td>
<td>Digital Signal Processing</td>
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<td>Second cycle</td>
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<td>EQ2310</td>
<td>Digital Communications</td>
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<td>Second cycle</td>
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<td>EQ2321</td>
<td>Speech and Audio Processing</td>
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### Course

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<th>Course code</th>
<th>Course name</th>
<th>Credits</th>
<th>Edu. level</th>
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<tr>
<td>EQ2401</td>
<td>Adaptive Signal Processing</td>
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<td>Second cycle</td>
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<td>EQ2411</td>
<td>Advanced Digital Communications</td>
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<td>Second cycle</td>
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<td>EQ2415</td>
<td>Machine Learning and Data Science</td>
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<td>Second cycle</td>
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<td>EQ2425</td>
<td>Analysis and Search of Visual Data</td>
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<td>Second cycle</td>
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<td>EQ2461</td>
<td>Seminars in Information and Network Engineering</td>
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<td>Theory and Methodology of Science with Applications</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td></td>
<td>(Natural and Technological Science)</td>
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</tr>
<tr>
<td></td>
<td><em>One of II2202, AK2036 shall be choosen</em></td>
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</tr>
<tr>
<td>II2202</td>
<td>Research Methodology and Scientific Writing</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td></td>
<td><em>One of II2202, AK2036 shall be choosen</em></td>
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</tbody>
</table>

### Supplementary information

Degree project 30 credits advanced level is mandatory during the spring term.

In accordance with KTH's regulations, a mandatory course in Research Methodology and Scientific Writing 7.5 credits needs to be included. This course can be taken anytime during the studies. Currently, the following courses are offered:

- II2202 Research Methodology and Scientific Writing 7.5 credits
- AK2036 Theory and Methodology of Science with Applications (Natural and Technological Science) 7.5 credits
Appendix 2: Specialisations

Master's Programme, ICT Innovation, 120 credits (TIVNM), Programme syllabus for studies starting in autumn 2019

**Autonomous Systems EIT (AUSM)**
Autonomous Systems focus on artificial intelligence (AI) in particular robotics, computer vision (image analysis), speech technology, distributed AI, machine learning and control technology, sensor networks and distributed systems.

**Autonomous Systems KTH (AUSY)**
Autonomous Systems focus on artificial intelligence (AI) in particular robotics, computer vision (image analysis), speech technology, distributed AI, machine learning and control technology, sensor networks and distributed systems.

**Cloud and Network infrastructures KTH (CLNI)**
The specialisation focuses on communication network design, management and operation on the one hand and cloud service and deployment models, and application design on the other. The program also addresses future directions of cloud computing, for example, in the fields of edge and fog computing as well as blockchains and distributed ledger applications.

**Cloud and Network infrastructures (CLNS)**
The specialisation focuses on communication network design, management and operation on the one hand and cloud service and deployment models, and application design on the other. The program also addresses future directions of cloud computing, for example, in the fields of edge and fog computing as well as blockchains and distributed ledger applications.

**Data Science EIT (DASC)**
Data Science focuses on a wide range of advanced topics in data-intensive computing platforms, i.e., existing frameworks to store and process Big Data as well as the basics of stream processing, data analysis, data mining, and algorithms, techniques and tools for machine learning to analyze very large amounts of data.

**Data Science KTH (DASE)**
Data Science focuses on a wide range of advanced topics in data-intensive computing platforms, i.e., existing frameworks to store and process Big Data as well as the basics of stream processing, data analysis, data mining, and algorithms, techniques and tools for machine learning to analyze very large amounts of data.

**Human Computer Interaction and Design EIT (HCID)**
Human Computer Interaction and Design focuses on 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.
Human Computer Interaction and Design KTH (HCIN)

Human Computer Interaction and Design focuses on 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.

Embedded Systems KTH (INSM)

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

Embedded Systems EIT (INSY)

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

Visual Computing and Communication KTH (VCCN)

Visual Computing and Communication focuses on communications systems design, modern network respectively. Internet technology, mobile and wireless technologies, properties of complex communications systems and user aspects.

Visual Computing and Communication EIT (VCCO)

Visual Computing and Communication focuses on communications systems design, modern network respectively. Internet technology, mobile and wireless technologies, properties of complex communications systems and user aspects.