Programme syllabus

Master's Programme, Engineering Design, 120 credits
Masterprogram, industriell produktutveckling

120.0 credits

Valid for students admitted to the education from autumn 11 (HT - Autumn term; VT - Spring term).

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

Programme objectives

Those who graduate from the Industrial Product Development programme (Engineering Design) should be able to:

Knowledge and understanding

- demonstrate knowledge of product development and engineering design, with both scientific foundation and proven experience;
- have a good understanding of current research and development, and industrial development trends;
- have a good understanding of the processes, methods and tools required to develop technical products;
- have good working knowledge of technical systems composed of mechanical and mechatronic components;
- have good knowledge of the interactive features of technology products, and the different interactions between technical systems, people and the surrounding environment;
- have good knowledge of techniques to be able to develop ecologically and economically sustainable products;
- have a good foundation in the natural and engineering sciences, with a specialization in mechanical engineering, mechatronics or internal combustion engineering at an advanced level.

Skills and abilities

- demonstrate the ability to carry out innovative and professional product development;
- be able to integrate knowledge holistically, and demonstrate the ability to critically and independently define and creatively identify, formulate and deal with complex phenomena, issues and situations;
- demonstrate the ability to create technical solutions that meet human and societal needs;
- be able to critically, independently and creatively plan and create (with adequate methods and tools) relevant products, processes and systems in a timely manner, thereby contributing to the development of knowledge and evaluation of the project concerned;
- be able to critically and systematically integrate knowledge, and show the ability to define, model, simulate, predict and evaluate behaviour and performance of heterogeneous technical systems even when faced with limited or significant elements of irrelevant information;
- take responsibility for, and demonstrate the ability to actively contribute to, effective teamwork in different types of collaborative groups;
- be able to clearly present and discuss, both orally and in writing, their conclusions and the knowledge and arguments behind them, in dialogue with different groups in a national as well as in an international context;
- demonstrate the skills required to participate in research and development work, or to work independently in other advanced technology activities.

Ability to make judgements and adopt a standpoint

- demonstrate an awareness of the ethical aspects of research and development, and be able to make judgments with regard to relevant scientific, social and ethical aspects;
demonstrate insight into the possibilities and limitations of engineering, its role in society and the responsibility for its use, including social and economic aspects, environmental and working-environment aspects;

- show a specific broad and deep understanding of the inherent complexity of technical systems, and be able to work with the subsequent understanding that the process of developing technical systems is often ill-defined with conflicting requirements and preferences;

- be aware of, and demonstrate a sense of, the responsibilities and ethical considerations that must be made in technical product development;

- show an aptitude for identifying the need for further knowledge, and to continuously upgrade their skills.

KTH’s local degree ordinance can be found in KTH’s guidelines www.kth.se

**Extent and content of the programme**

The programme comprises 120 higher education credits which correspond to two years of full-time study. The programme is primarily on the second level and starts once per year.

Selectable tracks for Engineering Design are:

- Machine Construction
- Mechatronics
- Combustion engine technology

The language of instruction is English.

**Eligibility and selection**

To be eligible for this Masters program candidates require a relevant education, preferably in Mechanical Engineering, equivalent to at least 180 credits, a Bachelor of Science degree or another recognised technical degree.

Similar engineering or science education at an undergraduate level can also be considered as an entry requirement, provided that the relevant courses in mechanical engineering and product development have been completed. Other studies or work experience are assessed based on the real skills and competencies acquired. For KTH English language masters programmes, there is a specific requirement for English B or equivalent.

The selection procedure for the program is based on an evaluation of the following criteria: university / college, grades, courses relevant to the application, the covering letter, work experience and references.

In general, please refer to the KTH admissions procedure as stated in the KTH rules, www.kth.se.

**Implementation of the education**

**Structure of the education**

The programme structure is designed to provide opportunities both for students taking the 5-year Civilingenjörs degree (programmes Design and Product Realization, Mechanical Engineering and Vehicle Engineering), and / or for those wishing to take a 2-year Masters degree in Engineering Design.

**Approach**

The Academic year, semesters and study periods are described in the KTH Regulations at: www.kth.se.

The overall programme provides a common training package, which is both good preparation for engineering research and also provides a solid core for the three tracks – Internal Combustion Engines, Machine Design and Mechatronics.

The program ends with a thesis, 30 credits at advanced level, during the fourth semester.

**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.

**Conditions for participation in the programme**

In order for a student to advance to the second academic year of the programme, they must have completed at least 45 credits during the first academic year (up until the last re-examination period before the second academic year begins).

Students who do not meet this requirement should arrange to meet with the counsellor at the ITM School Education Office to establish an individual study plan.

**Course enrolment**

Registration to all courses within the programme should be made during the preceding semester, in accordance with the KTH central guidelines.

**Choice of Track**

The choice of Track within the programme should be specified in the covering letter accompanying each student’s application. Applicants should be aware that each Track may have core courses that require prerequisite knowledge, which may involve adaptation courses (see Appendix 1).

**Recognition of previous academic studies**

Students can apply to transfer credits from courses they have passed at another college or university (national or international).

KTH’s policy for credit transfer can be found in full in the KTH Regulations at: www.kth.se.

**Studies abroad**

With the examiner’s approval, the work for the final thesis report can be performed abroad.

It is also possible to study abroad for single semesters at universities that offer similar courses.

**Degree project**

The Master thesis project comprises 30 credits at advanced level.

A student must have done at least 60 credits, including the required courses for their selected program before they can apply to begin work for their master thesis.

Master thesis work is graded according to the seven goal-related grades A-E, Fx, F (described above).

The rules for the Master thesis report can be found in greater depth in the KTH Regulations at: www.kth.se.

**Degree**

In order to be awarded the Degree of Master of Science (Two Years) students must achieve at least the passing grade in all of the courses specified in their curriculum (study plan). The study plan consists of 120 credits including a thesis of 30 credits, at the advanced level.

The student must apply for graduation and show proof of their Bachelors degree (or equivalent).

Information regarding KTH qualifications can be found at: www.kth.se
Appendix 1 - Course list
Appendix 2 - Programme syllabus descriptions
Appendix 1: Course list

Master's Programme, Engineering Design, 120 credits (TIPUM), Programme syllabus for studies starting in autumn 2011

Track, Combustion Engineering (IPUA)

Year 1

Mandatory courses (32.0 credits)

<table>
<thead>
<tr>
<th>Course code</th>
<th>Course name</th>
<th>Credits</th>
<th>Edu. level</th>
</tr>
</thead>
<tbody>
<tr>
<td>MF2045</td>
<td>Engineering Research Methodology</td>
<td>9.0</td>
<td>Second cycle</td>
</tr>
<tr>
<td></td>
<td>6 credits year 1, 3 credits year 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MF2047</td>
<td>Internal Combustion Engines 1</td>
<td>6.0</td>
<td>Second cycle</td>
</tr>
<tr>
<td>MF2048</td>
<td>Internal Combustion Engines 2</td>
<td>9.0</td>
<td>Second cycle</td>
</tr>
<tr>
<td>SD2222</td>
<td>Vehicle Components</td>
<td>8.0</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>EJ2410</td>
<td>Hybrid Vehicle Drives</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td></td>
<td>Energy and Environment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EL1120</td>
<td>Automatic Control, General Course</td>
<td>6.0</td>
<td>First cycle</td>
</tr>
<tr>
<td></td>
<td>Mechatronics, option 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>KE2170</td>
<td>Fuel Cell</td>
<td>6.0</td>
<td>Second cycle</td>
</tr>
<tr>
<td></td>
<td>Energy and Environment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MF1025</td>
<td>Model Based Product Development II</td>
<td>6.0</td>
<td>First cycle</td>
</tr>
<tr>
<td></td>
<td>Machine Design</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MF2007</td>
<td>Dynamics and Motion Control</td>
<td>9.0</td>
<td>Second cycle</td>
</tr>
<tr>
<td></td>
<td>Mechatronics, option 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MF2010</td>
<td>Component Design</td>
<td>6.0</td>
<td>Second cycle</td>
</tr>
<tr>
<td></td>
<td>Machine Design</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MF2018</td>
<td>Tribology</td>
<td>6.0</td>
<td>Second cycle</td>
</tr>
<tr>
<td></td>
<td>Machine Design</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MF2019</td>
<td>CAD 3D-modelling and Visualization</td>
<td>6.0</td>
<td>Second cycle</td>
</tr>
<tr>
<td></td>
<td>Machine Design</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Course code | Course name | Credits | Edu. level  
---|---|---|---  
MF2042 | Embedded Systems for Mechatronics, I  
*Mechatronics, option 2* | 6.0 | Second cycle  
MF2044 | Embedded Systems for Mechatronics, II  
*Mechatronics, option 2* | 6.0 | Second cycle  
SG2212 | Computational Fluid Dynamics  
*Fluid mechanics* | 7.5 | Second cycle  
SG2215 | Compressible Flow  
*Fluid mechanics* | 7.5 | Second cycle  
SG2218 | Turbulence  
*Fluid mechanics* | 7.5 | Second cycle  

### Supplementary information
You should read one of the profiles:

- Machine Design
- Energy and Environment
- Mechatronics, option 1
- Mechatronics, option 2
- Fluid Mechanics

### Year 2

#### Mandatory courses (45.0 credits)

| Course code | Course name | Credits | Edu. level  
---|---|---|---  
MF205X | Degree Project in Internal Combustion Engineering, Second Cycle | 30.0 | Second cycle  
MF2064 | Internal Combustion Engines Advanced Course  
3hp during year 1 + 12hp during year 2 | 15.0 | Second cycle  

#### Conditionally elective courses

| Course code | Course name | Credits | Edu. level  
---|---|---|---  
EJ2410 | Hybrid Vehicle Drives  
*Mechatronics* | 7.5 | Second cycle  
MJ2411 | Renewable Energy Technology  
*Energy and Environment* | 6.0 | Second cycle  

### Supplementary information
You must choose one of the profiles:

- Machine Design
- Energy and Environment
- Mechatronics, option 1
- Mechatronics, option 2
Track, Machine Design (IPUB)

Year 1

Mandatory courses (60.0 credits)

<table>
<thead>
<tr>
<th>Course code</th>
<th>Course name</th>
<th>Credits</th>
<th>Edu. level</th>
</tr>
</thead>
<tbody>
<tr>
<td>MF2004</td>
<td>Advanced Machine Design</td>
<td>6 credits during year 1, 12 credits during year 2</td>
<td>18.0</td>
</tr>
<tr>
<td>MF2006</td>
<td>Innovative Design II</td>
<td>6.0</td>
<td>Second cycle</td>
</tr>
<tr>
<td>MF2010</td>
<td>Component Design</td>
<td>6.0</td>
<td>Second cycle</td>
</tr>
<tr>
<td>MF2011</td>
<td>Systems Engineering</td>
<td>9.0</td>
<td>Second cycle</td>
</tr>
<tr>
<td>MF2024</td>
<td>Robust and Probabilistic Design</td>
<td>6.0</td>
<td>Second cycle</td>
</tr>
<tr>
<td>MF2030</td>
<td>Mechatronics basic Course</td>
<td>6.0</td>
<td>Second cycle</td>
</tr>
<tr>
<td>MF2045</td>
<td>Engineering Research Methodology</td>
<td>6 credits year 1, 3 credits year 2</td>
<td>9.0</td>
</tr>
</tbody>
</table>

Year 2

Mandatory courses (63.0 credits)

<table>
<thead>
<tr>
<th>Course code</th>
<th>Course name</th>
<th>Credits</th>
<th>Edu. level</th>
</tr>
</thead>
<tbody>
<tr>
<td>MF2004</td>
<td>Advanced Machine Design</td>
<td>6hp in year 1 + 12hp in year 2</td>
<td>18.0</td>
</tr>
<tr>
<td>MF2032</td>
<td>Eco Design</td>
<td>6.0</td>
<td>Second cycle</td>
</tr>
<tr>
<td>MF2045</td>
<td>Engineering Research Methodology</td>
<td>6 credits year 1 + 3 credits year 2</td>
<td>9.0</td>
</tr>
<tr>
<td>MF206X</td>
<td>Degree Project in Machine Design, Second Cycle</td>
<td>30.0</td>
<td>Second cycle</td>
</tr>
</tbody>
</table>

Track, Mechatronics (IPUC)

Year 1

Mandatory courses (52.0 credits)

<table>
<thead>
<tr>
<th>Course code</th>
<th>Course name</th>
<th>Credits</th>
<th>Edu. level</th>
</tr>
</thead>
<tbody>
<tr>
<td>MF2007</td>
<td>Dynamics and Motion Control</td>
<td>9.0</td>
<td>Second cycle</td>
</tr>
<tr>
<td>MF2030</td>
<td>Mechatronics basic Course</td>
<td>6.0</td>
<td>Second cycle</td>
</tr>
<tr>
<td>MF2042</td>
<td>Embedded Systems for Mechatronics, I</td>
<td>6.0</td>
<td>Second cycle</td>
</tr>
<tr>
<td>Course code</td>
<td>Course name</td>
<td>Credits</td>
<td>Edu. level</td>
</tr>
<tr>
<td>-------------</td>
<td>-------------------------------------------------</td>
<td>---------</td>
<td>--------------</td>
</tr>
<tr>
<td>MF2043</td>
<td>Robust Mechatronics</td>
<td>6.0</td>
<td>Second cycle</td>
</tr>
<tr>
<td>MF2044</td>
<td>Embedded Systems for Mechatronics, II</td>
<td>6.0</td>
<td>Second cycle</td>
</tr>
<tr>
<td>MF2045</td>
<td>Engineering Research Methodology</td>
<td>9.0</td>
<td>Second cycle</td>
</tr>
<tr>
<td></td>
<td>6 credits year 1, 3 credits year 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MF2057</td>
<td>Mechatronics Track Introduction</td>
<td>1.0</td>
<td>Second cycle</td>
</tr>
<tr>
<td>MF2058</td>
<td>Mechatronics, Advanced Course Spring Semester</td>
<td>9.0</td>
<td>Second cycle</td>
</tr>
</tbody>
</table>

**Year 2**

**Mandatory courses (54.0 credits)**

<table>
<thead>
<tr>
<th>Course code</th>
<th>Course name</th>
<th>Credits</th>
<th>Edu. level</th>
</tr>
</thead>
<tbody>
<tr>
<td>MF2045</td>
<td>Engineering Research Methodology</td>
<td>9.0</td>
<td>Second cycle</td>
</tr>
<tr>
<td></td>
<td>6hp during year 1 + 3hp during year 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MF204X</td>
<td>Degree Project in Mechatronics, Second Cycle</td>
<td>30.0</td>
<td>Second cycle</td>
</tr>
<tr>
<td>MF2059</td>
<td>Mechatronics, Advanced Course, Fall semester</td>
<td>15.0</td>
<td>Second cycle</td>
</tr>
</tbody>
</table>
Appendix 2: Specialisations

Master's Programme, Engineering Design, 120 credits (TIPUM), Programme syllabus for studies starting in autumn 2011

**Track, Combustion Engineering (IPUA)**

**Track, Machine Design (IPUB)**

**Track, Mechatronics (IPUC)**