Programme syllabus

Master's Programme, Vehicle Engineering, 120 credits
Masterprogram, fordonsteknik
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

Vehicle Engineering is a broad subject of engineering science driven by an ever increasing degree of mobility in the world. Transport, however, has to face the challenge to minimise the environmental impact it causes. New technical solutions are therefore needed in the future to make a transition to sustainable road and rail transport.

The objective of this programme is to educate engineers for a global industry, administrations and research institutions active in this area. It is a joint effort by several KTH departments, providing leading expertise in their respective areas of research. The Department of Aeronautical and Vehicle Engineering coordinates the programme and provides about half of the courses.

Knowledge and understanding

A Master of Science in Vehicle Engineering shall be competitive on an international market and will have:

- deep knowledge and understanding in the chosen field of technology and proven experience.
- deeper methodological knowledge, including the ability to apply theoretical knowledge on engineering problems.
- as well as deeper insight into current program of research development.

Skills and abilities

A Master of Science in Vehicle Engineering will have:

- ability to with a holistic view critically, independently and creatively identify, formulate and manage complex problems.
• an ability to create, analyze and critically evaluate different technical solutions.

• an ability to plan and use appropriate methods, carry out advanced tasks within a given framework and evaluate this work.

• the skill required to participate in research and development work or to work independently in other qualified areas and thereby contribute to knowledge development.

• the capacity for teamwork and collaboration in groups with different composition.

• an ability to both in national and international groups, orally and in writing clearly explain and discuss their conclusions and the knowledge and the arguments underlying these.

**Ability to make judgements and adopt a standpoint**

A Master of Science in Vehicle Engineering will:

• have an ability to make judgments with regard to relevant scientific, social and ethical aspects, and demonstrate awareness of ethical aspects of research and development.

• show insight regarding the possibilities and limitations of engineering science and its role in the society.

• be able to identify the need for further knowledge and take responsibility for keeping personal knowledge up to date.

Complete information on the degree requirements can be found in the local degree policy of KTH, see http://intra.kth.se/regelverk/utbildning-forskning/grundutbildning/examina

**Extent and content of the programme**

Vehicle Engineering is a two-year (120 university credits) master programme on the advanced level (second cycle). The instruction language is entirely English. After a short introductory part the programme consists of two basic tracks, i.e. road vehicles and rail vehicles, followed by four different profiles: structural design, functional design, control design and transport systems.

**Eligibility and selection**

**General eligibility requirements**

A completed Bachelor's degree, corresponding to a Swedish Bachelor's degree (180 ECTS), or equivalent academic qualifications from an internationally recognised university. Students in their final year of undergraduate education may also apply to KTH and if qualified, receive a conditional acceptance.

**Specific eligibility requirements**
A good knowledge of written and spoken English is required. Applicants must provide proof of their proficiency in English, e.g. reporting his/her TOEFL test score (Teaching Of English as a Foreign Language).

For more information see: http://www.kth.se/studies/programmes/master/admission?l=en_U

The applicant must have a basic degree, Bachelor's or similar, from a vehicle, mechanical engineering, or similar programme with sufficient theoretical depth and good academic results. Course work must include linear algebra, differential and integral calculus, differential equations, transforms, numerical analysis, rigid body mechanics, solid mechanics, fluid mechanics, thermodynamics and control theory.

Selection process

The selection process is based on a total evaluation of the following criteria: University, Grade Point Average (GPA), relevant course work and motivation to study.

Complete information on the eligibility requirements can be found at the local admission policy of KTH, see http://intra.kth.se/regelverk/utbildning-forskning/grundutbildning/antagning/1.27192

Implementation of the education

Structure of the education

The academic year at KTH, starting in early September and ending in late May, is divided into four study periods. Each period lasts approximately seven weeks with at least 33 days of study. Each period is followed by an exam period. In addition to the four regular exam periods, there are three additional re-examination periods: after Christmas, after May and the days preceding the first study period of the academic year. The academic year has a duration of 40 weeks. Teaching activities may, if necessary, be scheduled outside the academic year.

The first year in the programme is mainly dedicated to the compulsory courses in the basic curriculum. The second year mainly consists of elective courses and the final degree project.

Courses

The programme is course-based. Lists of courses are included in appendix 1.

The programme is course-based. A list of courses can be found in Appendix 1. The basic curriculum comprises of a short introductory part and one of the two tracks and corresponds to approximately 45 university credits.

Three of the courses listed in the chosen profile have to be taken. Further courses from the own profile, from the other three profiles or from the second track have to be taken. Together with the courses from the basic curriculum the sum of university credits has to be at least 75. This leaves about 15 university credits for optional (elective) courses. The structure of the programme is visualized in Figure 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**

No later than November 15 and May 15 each academic year, respectively, the students are required to make a study registration and course selection for the coming semester. In order for the student to be promoted to the second year of the programme, at least 45 university credits have to be completed during the first academic year (including the re-examination period in August).

Students have to make a decision about the track into road or rail vehicles and about the chosen profile in the very beginning of the programme. The programme director will inform about the different options during the reception at KTH.

**Recognition of previous academic studies**

Under certain circumstances, and in agreement with the programme director, credits for previous studies can be received according to the local policy of KTH, see http://intra.kth.se/regelverk/utbildning-forskning/grundutbildning/prestationer/1.27200

**Degree project**

Students admitted to the programme are required to perform an independent study in the form of a MSc thesis project corresponding to 30 university credits. To begin the thesis project, a student must have completed at least 60 university credits of the total course work of which at least four of the six compulsory courses in the track (including the two common compulsory courses).

The purpose of the thesis project is that the student should demonstrate the ability to perform independent project work, using and developing the skills obtained from the courses in the programme. The thesis project can either be performed at a university or, more commonly, at a company. The student must actively search for a suitable thesis project in industry; however KTH will provide some assistance with information on suitable points of contact. More information on the KTH policy on the degree project can be found at http://intra.kth.se/regelverk/utbildning-forskning/grundutbildning/examensarbete

**Degree**

Students who fulfill all the requirements will be awarded a Degree of Master of Science (two years, 120 university credits). Students must apply for the degree and also show proof of their basic degree (Bachelor's or similar). Complete information on the degree requirements can be found in the local degree policy of KTH, see http://intra.kth.se/regelverk/utbildning-forskning/grundutbildning/examina

Appendix 1 - Course list
Appendix 2 - Programme syllabus descriptions
# Appendix 1: Course list

Master's Programme, Vehicle Engineering, 120 credits (TFORM), Programme syllabus for studies starting in autumn 2013

## General courses

### Year 1

### Mandatory courses (8.0 Credits)

<table>
<thead>
<tr>
<th>Course code</th>
<th>Course name</th>
<th>Credits</th>
<th>Edu. level</th>
</tr>
</thead>
<tbody>
<tr>
<td>SD2221</td>
<td>Vehicle System Technology</td>
<td>8.0 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>
</tr>
</thead>
<tbody>
<tr>
<td>ME1003</td>
<td>Industrial Management, Basic Course</td>
<td>6.0 hp</td>
<td>First cycle</td>
</tr>
<tr>
<td>MF2048</td>
<td>Internal Combustion Engines 2</td>
<td>9.0 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>SD2228</td>
<td>Environmental Friendly Vehicle - Project Course</td>
<td>8.0 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>SG2150</td>
<td>Rigid Body Dynamic</td>
<td>7.0 hp</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>AF2901</td>
<td>Road- and Railway Track Engineering</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>AH2177</td>
<td>Transport and Geodata Analysis</td>
<td>6.0 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>AH2307</td>
<td>Urban Modeling and Decision Support</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>EL2520</td>
<td>Control Theory and Practice, Advanced Course</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>Course Code</td>
<td>Course Title</td>
<td>Profile</td>
<td>Credits</td>
</tr>
<tr>
<td>-------------</td>
<td>------------------------------------------------------------------------------</td>
<td>---------</td>
<td>---------</td>
</tr>
<tr>
<td>MF2007</td>
<td>Dynamics and Motion Control</td>
<td></td>
<td>9.0 hp</td>
</tr>
<tr>
<td>MF2030</td>
<td>Mechatronics basic Course</td>
<td></td>
<td>6.0 hp</td>
</tr>
<tr>
<td>MF2042</td>
<td>Embedded Systems for Mechatronics, I</td>
<td></td>
<td>6.0 hp</td>
</tr>
<tr>
<td>MF2043</td>
<td>Robust Mechatronics</td>
<td></td>
<td>6.0 hp</td>
</tr>
<tr>
<td>MF2044</td>
<td>Embedded Systems for Mechatronics, II</td>
<td></td>
<td>6.0 hp</td>
</tr>
<tr>
<td>SD1116</td>
<td>Design of Silent and Vibration-free Products</td>
<td>Functional</td>
<td>6.0 hp</td>
</tr>
<tr>
<td>SD2140</td>
<td>Vibro Acoustics</td>
<td>Functional</td>
<td>8.0 hp</td>
</tr>
<tr>
<td>SD2150</td>
<td>Experimental Structure Dynamics, Project Course</td>
<td>Structural</td>
<td>9.0 hp</td>
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<tr>
<td>SD2155</td>
<td>Flow Acoustics</td>
<td>Functional</td>
<td>6.0 hp</td>
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<tr>
<td>SD2190</td>
<td>Vehicle Acoustics and Vibration</td>
<td>Functional</td>
<td>6.0 hp</td>
</tr>
<tr>
<td>SD2411</td>
<td>Lightweight Structures and FEM</td>
<td>Structural</td>
<td>8.0 hp</td>
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<tr>
<td>SD2416</td>
<td>Structural Optimisation and Sandwich Design</td>
<td>Structural</td>
<td>6.0 hp</td>
</tr>
<tr>
<td>SD2625</td>
<td>Computational Road Vehicle Aerodynamics</td>
<td>Functional</td>
<td>3.0 hp</td>
</tr>
<tr>
<td>SG2211</td>
<td>Vehicle Aerodynamics</td>
<td>Functional</td>
<td>6.0 hp</td>
</tr>
<tr>
<td>SG2214</td>
<td>Fluid Mechanics</td>
<td>Functional</td>
<td>7.5 hp</td>
</tr>
</tbody>
</table>

**Supplementary information**

*For students who has not done a Degree project, first level, SD2221 is compulsory.

Compulsory courses + conditionally elective courses + ev courses from the other track = at least 75 cr.

From Autumn term 2014 it is not necessary to follow a profile.

**Year 2**

**Mandatory courses (15.0 Credits)**
### Course code | Course name | Credits Edu. level
--- | --- | ---
AK2036 | Theory and Methodology of Science with Applications (Natural and Technological Science) | 7.5 hp  Second cycle
SD2229 | Vehicle Dynamics Project Course Part 1 | 7.5 hp  Second cycle

**Conditionally elective courses**

| Course code | Course name | Credits Edu. level
--- | --- | ---
AF2901 | Road- and Railway Track Engineering | 7.5 hp  Second cycle
AH2171 | Traffic Engineering and Management | 7.5 hp  Second cycle
AH2174 | Traffic Simulation Modelling and Applications | 7.5 hp  Second cycle
AH2177 | Transport and Geodata Analysis | 6.0 hp  Second cycle
AH2307 | Urban Modeling and Decision Support | 7.5 hp  Second cycle
MF2030 | Mechatronics basic Course | 6.0 hp  Second cycle
MF2043 | Robust Mechatronics | 6.0 hp  Second cycle
SD2111 | Engineering Acoustics | 6.0 hp  Second cycle
SD2190 | Vehicle Acoustics and Vibration | 6.0 hp  Second cycle
SD2230 | Vehicle Dynamics Project Course Part 2 | 7.5 hp  Second cycle
SD2411 | Lightweight Structures and FEM | 8.0 hp  Second cycle
SD2416 | Structural Optimisation and Sandwich Design | 6.0 hp  Second cycle
SG2214 | Fluid Mechanics | 7.5 hp  Second cycle

**Supplementary information**

Compulsory courses + conditionally elective courses + ev courses from the other track = at least 75 cr.

From Autumn term 2014 it is not necessary to follow a profile.

**Track, Automotive (FORA)**

**Year 1**

**Mandatory courses (25.0 Credits)**

| Course code | Course name | Credits Edu. level
--- | --- | ---
MF2047 | Internal Combustion Engines 1 | 6.0 hp  Second cycle
SD2222 | Vehicle Components | 8.0 hp  Second cycle
SD2225 | Ground Vehicle Dynamics, Basic Course | 11.0 hp  Second cycle

**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>
</tr>
</thead>
<tbody>
<tr>
<td>EJ2410</td>
<td>Hybrid Vehicle Drives</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>MF2047</td>
<td>Internal Combustion Engines 1</td>
<td>6.0 hp</td>
<td>Second cycle</td>
</tr>
</tbody>
</table>

#### Track, Railway (FORB)

### Year 1

#### Mandatory courses (21.5 Credits)

<table>
<thead>
<tr>
<th>Course code</th>
<th>Course name</th>
<th>Credits</th>
<th>Edu. level</th>
</tr>
</thead>
<tbody>
<tr>
<td>EJ2400</td>
<td>Electric Traction</td>
<td>6.0 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>SD2307</td>
<td>Rail Vehicle Technology</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>SD2313</td>
<td>Rail Vehicle Dynamics</td>
<td>8.0 hp</td>
<td>Second cycle</td>
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### Year 2

#### Mandatory courses (7.5 Credits)

<table>
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<th>Edu. level</th>
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</thead>
<tbody>
<tr>
<td>AH2026</td>
<td>Railway Traffic - Market and Planning, Basic Course</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
</tbody>
</table>
Appendix 2: Specialisations

Master's Programme, Vehicle Engineering, 120 credits (TFORM), Programme syllabus for studies starting in autumn 2013

Track, Automotive (FORA)

The road vehicle track includes all types of road vehicles with main focus on cars, trucks and buses. The track gives a basic knowledge of vehicle components and their functionality including modeling, validation and analysis. Furthermore, it also gives a deeper knowledge on how to model, simulate, measure and evaluate the dynamic behavior of road vehicles.

Track, Railway (FORB)

In the rail vehicle track the system aspect is very important, since the different parts of a railway system like vehicle, track, electrification system and signalling system strongly influence each other. Besides a broad overview on all aspects of railway traffic, dynamic vehicle-track interaction is one of the focus areas.