



# Programme syllabus

Master's Programme, Engineering Mechanics, 120 credits

Masterprogram, teknisk mekanik

*120.0 credits*

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*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

Engineering Mechanics is an important part of the design process for a large variety of products. More complex and challenging requests make the demand for engineers trained to deal with complicated mechanical problems high. The overall objective of the programme is graduated students, with advanced, relevant and working knowledge in engineering mechanics, well equipped for work in both domestic and international enterprises. The programme is well balanced between theoretical studies and practical applications and provides a platform for a successful career in industry or towards a doctoral degree.

### Knowledge and understanding

A master of science in Engineering Mechanics will demonstrate ability to

- master and independently apply basic and advanced engineering mechanics principles, and
- analyse complex mechanical problems using state-of-the-art numerical and experimental methods.

### Skills and abilities

A master of science in Engineering Mechanics will demonstrate ability to

- critically, independently, creatively and systematically analyse, judge and handle complex mechanical problems and situations within given time limits and even with access to limited information,
- create, analyse and critically evaluate various technical solutions,
- follow the latest development and research in engineering mechanics, and participate in research and development work in the field,
- integrate knowledge and model, simulate and analyse engineering mechanics problems using state-of-the-art numerical and experimental methods,
- develop and design products and processes while taking into account the circumstances and needs of individuals and the targets for economically, socially and ecologically sustainable development,

- work in teams and collaborate in with various constellations, and
- communicate and discuss results, conclusions and the underlying theory and argumentation in a competent and intelligible manner, both orally and in writing.

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

A master of science in Engineering Mechanics will demonstrate ability to

- make decisions in the field of engineering mechanics regarding development work based on relevant scientific, societal and ethical aspects,
- show insight regarding the possibilities and limitations of engineering science and its role in the society, and
- identify the need for further knowledge in the field and take responsibility for keeping the personal knowledge up to date.

Complete information on degree requirements can be found at the local degree policy of KTH, [www.kth.se](http://www.kth.se)

## **Extent and content of the programme**

Engineering Mechanics is a two-year (120 ECTS) master programme on the advanced level (second cycle) and starts in the end of August each year. The programme is composed of three two-year tracks: Fluid Mechanics, Solid Mechanics and Sound and Vibration. The language of the programme is English.

## **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.
- English language proficiency equivalent to (the Swedish upper secondary school) English course B /6. There are different ways to fulfill the English language requirements, see: [www.kth.se](http://www.kth.se) The applicant must have a Bachelor degree or similar including course works in

### **Specific eligibility requirements:**

- Mathematics (including calculus, linear algebra, numerical analysis and differential equations) corresponding to at least 25 ECTS credits in total.
- Applied mechanics, for example mechanics and physics, solid mechanics, fluid mechanics and sound and vibration or similar to at least 20 ECTScredits in total.

### **Selection process**

The selection process is based on the following selection criteria: University ranking and study performance from previous University studies. The evaluation scale is 1-75. The applicant will get a lower evaluation score if the mandatory program-specific summary sheet is missing from the application documents, which also applies to Swedish applicants.

# Implementation of the education

## Structure of the education

The academic year at KTH is divided into four 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 four additional re-examination periods: before Christmas, in April, after May and immediately preceding the first study period of the academic year.

The academic year lasts for a duration of 40 weeks.

Teaching activities may, if necessary, be scheduled outside the academic year.

## Courses

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

The programme is course-based and the course part corresponds to 90 ECTS (the thesis is 30 ECTS). Each track starts with basic courses, which must be selected if equivalent courses are not included in the student's Bachelor's degree. The basic courses for each track are listed in Appendix 1. The compulsory courses correspond to between 21.5 and 37.5 ECTS depending on track. This leaves between 52.5 and 68.5 ECTS for elective courses. The first part of the elective courses must be on the advanced level and selected from the list of courses in Appendix 1. Together with the compulsory courses, the first part of the elective courses shall add up to at least 70 ECTS. The choice of elective courses from the list in Appendix 1 is not completely free, because each track has a pool of four to six courses and at least one of these recommended courses must be selected. The remaining second part of the elective courses, at most 20 ECTS, does not need to be selected from the course list in Appendix 1, but an elective course may not be similar to a course already completed in a previous degree.

The list of compulsory and elective courses is given in appendix 1.

## Grading system

Courses in the first and the second cycle are graded on a scale from A to F. A-E are passing grades, A is the highest grade. The grades pass (P) and fail (F) are used for courses under certain circumstances.

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The grades pass (P) and fail (F) are used for thesis work.

## Conditions for participation in the programme

For students starting their education from the autumn semester 2018, previous promotion requirements have been replaced with special admission requirements to each course. Admission requirements are specified in the course syllabus.

## Course application

All programme students apply for courses 1-15 November/1-15 May for the next semester. The application is done via [universityadmissions.se](http://universityadmissions.se)

### Course registration

Students admitted to an educational programme at KTH must register for the courses they intend to study. Course registration is required for the examination and means that the student is active.

## **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.

## **Studies abroad**

Students have the opportunity to spend one semester at one of KTH's partner universities abroad.

For more information and recommendation on the appropriate semester for exchange studies refer to the International coordinator.

## **Degree project**

A 30-credit Master's degree project is carried out at the end of the educational programme and may begin when special admission requirements for the course are fulfilled.

The purpose of the project is to let the student study a problem in more depth than is possible in the courses. The project may be carried out in an academic or industrial environment in Sweden or abroad.

The choice of project must be approved by the programme director.

The Degree project is graded with P/F.

## **Degree**

In order to earn a Degree of Master of Science, passing grades in all courses which are included in the student's study plan are required. The study plan must comprise 120 higher education credits which include a degree project consisting of 30 higher education credits, in the second cycle.

KTH's local degree ordinance can be found at KTH's website, [www.kth.se](http://www.kth.se).

## **Application for degree certificate**

When the studies at KTH are completed a degree certificate can be applied for.

Application is done by the "personal menu" at [www.kth.se](http://www.kth.se)

[Appendix 1 - Course list](#)

[Appendix 2 - Programme syllabus descriptions](#)





# Appendix 1: Course list

Programme syllabus for studies starting in autumn 2019, Master's Programme, Engineering Mechanics, 120 credits (TTEMM)

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## General courses

### Year 1

#### Mandatory courses (7.5 Credits)

Code	Name	Credits	Edu. level
<a href="#">AK2030</a>	<a href="#">Theory and Methodology of Science (Natural and Technological Science)</a>	4.5 hp	Second cycle
<a href="#">SG2128</a>	<a href="#">Research Methodology in Engineering Mechanics</a>	3.0 hp	Second cycle

#### Conditionally elective courses

Code	Name	Credits	Edu. level
<a href="#">SD2110</a>	<a href="#">Introduction to Noise Control</a>	3.0 hp	Second cycle
<a href="#">SD2111</a>	<a href="#">Engineering Acoustics</a>	6.0 hp	Second cycle
<a href="#">SD2125</a>	<a href="#">Signals and Mechanical Systems</a>	6.0 hp	Second cycle
<a href="#">SD2140</a>	<a href="#">Vibro Acoustics</a>	8.0 hp	Second cycle
<a href="#">SD2150</a>	<a href="#">Experimental Structure Dynamics, Project Course</a>	9.0 hp	Second cycle
<a href="#">SD2155</a>	<a href="#">Flow Acoustics</a>	6.0 hp	Second cycle
<a href="#">SD2165</a>	<a href="#">Acoustical Measurements</a>	8.0 hp	Second cycle
<a href="#">SD2166</a>	<a href="#">Building Acoustics and Community Noise</a>	7.5 hp	Second cycle
<a href="#">SD2170</a>	<a href="#">Energy Methods</a>	6.0 hp	Second cycle
<a href="#">SD2175</a>	<a href="#">Numerical Methods for Acoustics and Vibration</a>	9.0 hp	Second cycle
<a href="#">SE1025</a>	<a href="#">FEM for Engineering Applications</a> <i>Given in English in per 1 and in Swedish in per 3.</i>	6.0 hp	First cycle
<a href="#">SE2121</a>	<a href="#">Introduction to Biomechanics</a>	9.0 hp	Second cycle
<a href="#">SE2123</a>	<a href="#">Testing Techniques in Solid Mechanics</a>	6.0 hp	Second cycle
<a href="#">SE2126</a>	<a href="#">Material Mechanics</a>	9.0 hp	Second cycle
<a href="#">SE2132</a>	<a href="#">Applied Elasticity with FEM</a>	9.0 hp	Second cycle
<a href="#">SE2134</a>	<a href="#">Dynamic Problems in Solid Mechanics</a>	7.5 hp	Second cycle
<a href="#">SE2137</a>	<a href="#">Fatigue</a>	6.0 hp	Second cycle
<a href="#">SE2139</a>	<a href="#">Fracture Mechanics</a>	6.0 hp	Second cycle

<a href="#">SE2860 FEM Modelling</a>	8.0 hp	Second cycle
<a href="#">SG2211 Vehicle Aerodynamics</a>	6.0 hp	Second cycle
<a href="#">SG2212 Computational Fluid Dynamics</a>	7.5 hp	Second cycle
<a href="#">SG2214 Fluid Mechanics</a>	7.5 hp	Second cycle
<a href="#">SG2215 Compressible Flow</a>	7.5 hp	Second cycle
<a href="#">SG2218 Turbulence</a>	7.5 hp	Second cycle
<a href="#">SG2221 Wave Motions and Hydrodynamic Stability</a>	7.5 hp	Second cycle
<a href="#">SG2222 Micro Fluids</a>	4.5 hp	Second cycle
<a href="#">SG2224 Applied Computational Fluid Dynamics</a>	5.0 hp	Second cycle
<a href="#">SG2225 Fluid Mechanics Continuation Course</a>	4.0 hp	Second cycle

### Supplementary information

The course requirements for each track are listed below. Note that for all tracks at least one of the courses recommended for Year 1 or Year 2 is required.

#### Fluid Mechanics track

Mandatory courses + recommended courses + conditionally elective courses = at least 70 hp.

#### Solid Mechanics track

Mandatory courses + at least one recommended course.

#### Sound and Vibration track

Mandatory courses + recommended courses + conditionally elective courses = at least 70 hp.

Students who have studied SG1215 shall select SG2225 instead of SG2214.

### Year 2

#### Mandatory courses (7.5 Credits)

Code	Name	Credits	Edu. level
<a href="#">AK2030</a>	<a href="#">Theory and Methodology of Science (Natural and Technological Science)</a>	4.5 hp	Second cycle
<a href="#">SG2128</a>	<a href="#">Research Methodology in Engineering Mechanics</a>	3.0 hp	Second cycle

#### Conditionally elective courses

Code	Name	Credits	Edu. level
<a href="#">SD2111</a>	<a href="#">Engineering Acoustics</a>	6.0 hp	Second cycle
<a href="#">SD2125</a>	<a href="#">Signals and Mechanical Systems</a>	6.0 hp	Second cycle
<a href="#">SD2165</a>	<a href="#">Acoustical Measurements</a>	8.0 hp	Second cycle
<a href="#">SD2166</a>	<a href="#">Building Acoustics and Community Noise</a>	7.5 hp	Second cycle

<a href="#">SD2180 Non-linear Acoustics</a>	6.0 hp	Second cycle
<a href="#">SD2190 Vehicle Acoustics and Vibration</a>	6.0 hp	Second cycle
<a href="#">SE2126 Material Mechanics</a>	9.0 hp	Second cycle
<a href="#">SE2132 Applied Elasticity with FEM</a>	9.0 hp	Second cycle
<a href="#">SE2137 Fatigue</a>	6.0 hp	Second cycle
<a href="#">SE2145 Reliability, Optimization and Design</a>	9.0 hp	Second cycle
<a href="#">SE2152 Mechanics of Fiber Networks and Materials</a>	8.0 hp	Second cycle
<a href="#">SE2860 FEM Modelling</a>	8.0 hp	Second cycle
<a href="#">SE2870 Fem for Nonlinear Problems in Solid Mechanics</a>	7.0 hp	Second cycle
<a href="#">SG1220 Fluid Mechanics for Engineers</a>	6.0 hp	First cycle
<a href="#">SG2010 Project Course in Engineering Mechanics</a>	15.0 hp	Second cycle
<a href="#">SG2150 Rigid Body Dynamic</a>	7.0 hp	Second cycle
<a href="#">SG2214 Fluid Mechanics</a>	7.5 hp	Second cycle
<a href="#">SG2218 Turbulence</a>	7.5 hp	Second cycle
<a href="#">SG2219 Advanced Compressible Flows</a>	7.5 hp	Second cycle
<a href="#">SG2221 Wave Motions and Hydrodynamic Stability</a>	7.5 hp	Second cycle
<a href="#">SG2225 Fluid Mechanics Continuation Course</a>	4.0 hp	Second cycle
<a href="#">SG2226 Wind Energy Aerodynamics</a>	6.0 hp	Second cycle
<a href="#">SG2804 Biomechanics of Human Movement</a>	7.0 hp	Second cycle

### Supplementary information

The course requirements for each track are listed below. Note that for all tracks at least one of the courses recommended for Year 1 or Year 2 is required.

#### Fluid Mechanics track

Mandatory courses + recommended courses + conditionally elective courses = at least 70 hp.

#### Solid Mechanics track

Mandatory courses + at least one recommended course.

#### Sound and Vibration track

Mandatory courses + recommended courses + conditionally elective courses = at least 70 hp.

Students who have studied SG1215 shall select SG2225 instead of SG2214.

## Track, Fluid Mechanics (TEMA)

### Year 1

#### Mandatory courses (44.0 Credits)



Code	Name	Credits	Edu. level
<a href="#">SG1218</a>	<a href="#">Fluid Mechanics</a> *	4.0 hp	First cycle
<a href="#">SG1220</a>	<a href="#">Fluid Mechanics for Engineers</a> *	6.0 hp	First cycle
<a href="#">SG2212</a>	<a href="#">Computational Fluid Dynamics</a>	7.5 hp	Second cycle
<a href="#">SG2214</a>	<a href="#">Fluid Mechanics</a>	7.5 hp	Second cycle
<a href="#">SG2215</a>	<a href="#">Compressible Flow</a>	7.5 hp	Second cycle
<a href="#">SG2218</a>	<a href="#">Turbulence</a>	7.5 hp	Second cycle
<a href="#">SG2225</a>	<a href="#">Fluid Mechanics Continuation Course</a> <i>For students who has studied SG1215</i>	4.0 hp	Second cycle

### Recommended courses

Code	Name	Credits	Edu. level
<a href="#">SD2155</a>	<a href="#">Flow Acoustics</a>	6.0 hp	Second cycle
<a href="#">SE1025</a>	<a href="#">FEM for Engineering Applications</a> <i>Given in English in per 1 and in Swedish in per 3</i>	6.0 hp	First cycle

### Supplementary information

At least one of the recommended courses under year one and two has to be studied.

Students who intends to select the Fluid Mechanics track and in their bachelor education is missing a basic course in Fluid Mechanics should contact the programme coordinator: master@sci.kth.se.

Students who have studied SG1215 or SG1218 shall select SG2225 instead of SG2214.

## Year 2

### Recommended courses

Code	Name	Credits	Edu. level
<a href="#">SD2180</a>	<a href="#">Non-linear Acoustics</a>	6.0 hp	Second cycle
<a href="#">SE2126</a>	<a href="#">Material Mechanics</a>	9.0 hp	Second cycle
<a href="#">SE2132</a>	<a href="#">Applied Elasticity with FEM</a>	9.0 hp	Second cycle

### Supplementary information

At least one of the recommended courses under year one and two has to be studied.

## Track, Solid Mechanics (TEMB)

### Year 1

## Mandatory courses (32.0 Credits)

Code	Name	Credits	Edu. level
<a href="#">SE1025</a>	<a href="#">FEM for Engineering Applications</a> <i>For students who has not studied corresponding course before</i>	6.0 hp	First cycle
<a href="#">SE2126</a>	<a href="#">Material Mechanics</a>	9.0 hp	Second cycle
<a href="#">SE2132</a>	<a href="#">Applied Elasticity with FEM</a>	9.0 hp	Second cycle
<a href="#">SE2860</a>	<a href="#">FEM Modelling</a>	8.0 hp	Second cycle

## Recommended courses

Code	Name	Credits	Edu. level
<a href="#">SD2140</a>	<a href="#">Vibro Acoustics</a>	8.0 hp	Second cycle
<a href="#">SD2150</a>	<a href="#">Experimental Structure Dynamics, Project Course</a>	9.0 hp	Second cycle

## Supplementary information

At least one of the recommended courses under year one or two has to be studied.

## Year 2

### Recommended courses

Code	Name	Credits	Edu. level
<a href="#">SD2125</a>	<a href="#">Signals and Mechanical Systems</a>	6.0 hp	Second cycle
<a href="#">SG1220</a>	<a href="#">Fluid Mechanics for Engineers</a>	6.0 hp	First cycle
<a href="#">SG2150</a>	<a href="#">Rigid Body Dynamic</a>	7.0 hp	Second cycle
<a href="#">SG2214</a>	<a href="#">Fluid Mechanics</a>	7.5 hp	Second cycle
<a href="#">SG2225</a>	<a href="#">Fluid Mechanics Continuation Course</a>	4.0 hp	Second cycle

## Supplementary information

At least one of the recommended courses under year one or two has to be studied.

Students who have studied SG1215 or SG1218 shall select SG2225 instead of SG2214.

SG1220 Fluid Mechanics (Not for student who has already studied a basic course in Fluid Mechanics)

## Track, Sound and Vibrations (TEMC)

### Year 1

#### Mandatory courses (14.0 Credits)

Code	Name	Credits	Edu. level
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[SD2140 Vibro Acoustics](#) 8.0 hp Second cycle  
[SD2155 Flow Acoustics](#) 6.0 hp Second cycle

### Conditionally elective courses

Code	Name	Credits	Edu. level
<a href="#">SD1116</a> *	<a href="#">Design of Silent and Vibration-free Products</a>	6.0 hp	First cycle
<a href="#">SD1120</a> *	<a href="#">Noise and Vibration Control</a>	9.0 hp	First cycle
<a href="#">SD2111</a> *	<a href="#">Engineering Acoustics</a>	6.0 hp	Second cycle
<a href="#">SD2125</a> *	<a href="#">Signals and Mechanical Systems</a>	6.0 hp	Second cycle
<a href="#">SD2166</a>	<a href="#">Building Acoustics and Community Noise</a>	7.5 hp	Second cycle

### Recommended courses

Code	Name	Credits	Edu. level
<a href="#">SE2123</a>	<a href="#">Testing Techniques in Solid Mechanics</a>	6.0 hp	Second cycle
<a href="#">SE2860</a>	<a href="#">FEM Modelling</a>	8.0 hp	Second cycle
<a href="#">SG2211</a>	<a href="#">Vehicle Aerodynamics</a>	6.0 hp	Second cycle
<a href="#">SG2215</a>	<a href="#">Compressible Flow</a>	7.5 hp	Second cycle

### Supplementary information

\*SD1116, SD1120, SD2111 and SD2125 are basic courses. For students who has not studied corresponding course before, one has to be studied.

At least one of the recommended courses under year one and two has to be studied.

## Year 2

### Recommended courses

Code	Name	Credits	Edu. level
<a href="#">SD2166</a>	<a href="#">Building Acoustics and Community Noise</a>	7.5 hp	Second cycle
<a href="#">SE2126</a>	<a href="#">Material Mechanics</a>	9.0 hp	Second cycle
<a href="#">SE2132</a>	<a href="#">Applied Elasticity with FEM</a>	9.0 hp	Second cycle

### Supplementary information

At least one of the recommended courses under year one and two has to be studied.





## Appendix 2: Specialisations

Programme syllabus for studies starting in autumn 2019, Master's Programme, Engineering Mechanics, 120 credits (TTEMM)

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### **Track, Fluid Mechanics (TEMA)**

Mechanics of solids, fluids and gases are fundamental areas within classical physics and plays a pivotal role in the design and analysis in almost every branch of engineering science. Today, this position is enhanced by even larger amount of the areas engulfed by the subject. For instance, chemical and material sciences in combination with fluid mechanics lead to a deeper understanding of various physical phenomena and also lead to new technical innovations. The courses in fluid mechanics, turbulence, compressible flow, computational fluid dynamics and vehicle aerodynamics provide a stable platform for solving complex fluid mechanics problems in industry or performing research towards a PhD. The Fluid Physics and Applied Fluid Mechanics Laboratory is a part of the Department of Mechanics where both experimental and computational projects of various fluid dynamical systems are carried out. The Linné FLOW Centre is an environment for fundamental research in fluid mechanics, with research projects integrating experiments, computations and theory and combining expertise in stability and transition, flow control, turbulence and geophysical flows, micro-fluid flows, multiphase flows, aero-acoustics and numerical analysis.

### **Track, Solid Mechanics (TEMB)**

Solid Mechanics can be seen as a link between material science and applied mechanics with more focus on the latter. Solid Mechanics deals with the mechanical behaviour of materials and structures. The research at the Department of Solid Mechanics covers computational, fracture, composite, contact, material, bio and paper mechanics as well as reliability and fatigue. A primary goal of this research is to develop methods for reliable design of structures, material systems and processes. The Department of Solid Mechanics is host for the Biofibre Material (BiMaC) Excellence Centre and the Forest Products Industry Research College (FPIRC). The research within the field of solid mechanics at the Department of Mechanics is focused on the behavior biomechanical systems. The track in Solid Mechanics is composed of fundamental and advanced courses.

### **Track, Sound and Vibrations (TEMC)**

Noise and vibration are important issues in modern society. Applications of technical acoustics cover an extremely wide field, from applied mathematics and mechanics to measuring techniques plus signal processing down to motors, transport and building technology. The Marcus Wallenberg Laboratory for Sound and Vibration Research (MWL) is a part of the Department of Aeronautical and Vehicle Engineering and is the largest university centre in northern Europe in the area of sound and vibration research. The track in Sound and Vibration introduces acoustics as an integrated element of engineering

with a particular bearing on mechanics, fluid dynamics and solid mechanics. The contents of the courses cover a wide area within sound and vibration control. Included are fundamental principles on sound and vibration generation, transmission and reduction in complex structures, with coupling between vibrating structures and surrounding media, such as gases and liquids.