



# Programme syllabus

## Degree Programme in Medical Engineering Civilingenjörsutbildning i medicinsk teknik 300.0 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

The programme is Sweden's first Master of Science in Engineering within Medical Engineering and should educate the future's engineers for work in the area where technology and medicine meet. A Master of Science in Engineering within Medical engineering will have the knowledge in order to, in different medical-technical situation, be able to both analyse and solve problems and think innovative.

Beyond the goals which are specified in the Higher education ordinance, a Master of Science in Engineering who graduates from the programme in Medical Engineering, should show:

#### Knowledge and understanding

- deep knowledge within mathematics and natural science and technology within the chosen technical specialisation (second level)
- Deep knowledge within the medical-technical area, knowledge within anatomy, physiology, and medicine, and understanding for health and medical care's need of technical solutions.
- Knowledge and scientific tools in order to analyse, work with and evaluate facts and awareness about how knowledge is developed within natural science, technology and social science.

#### Skills and abilities

- The ability to independently, as well as in a group, be able to convert knowledge and abilities into practical usage with regards to relevant scientific, professional, and social judgments and approaches
- The ability to analyse, formulate and handle technical problems from a system perspective, with the starting point in the needs and function and also with regards to business related conditions, medical consideration and technology's relationship with society.
- The ability to communicate orally and in writing, in Swedish and English, with different target groups, especially medical care's different players, on a level which is required for an international carrier.

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

- responsibility and appreciation for ethics with regards to technical, medical, economical, environmental, and society questions.
- awareness about how one's own personal values and approaches affect definitions and judgements of technical and medical problems
- a critical approach to established methods and theories and to how knowledge is developed within natural science, technology and social science.
- desire to follow and utilise knowledge development within the medical-technical area

For the local degree ordinance, see the KTH-handbook.

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

The Master of Science programme in Medical Engineering is composed of 300 ECTS credits, which, at normal study rate, corresponds to 5 years of full-time study (10 semesters).

The first three years (180 ECTS credits) are on undergraduate level.

The final two years (120 ECTS credits) the student follows a master programme.

The academic year 2018/2019 the following Master's programmes for a Degree of Master of Science in Medical Engineering are offered\*:

- Medical Engineering
- Sports Technology
- Engineering Physics, Track Biomedical Physics

\*The range of offered Master's programmes may be revised. An updated list of elective Master's programmes can be found on the KTH student web for each respective academic year.

The master's programmes consist of courses mainly on advanced level. The education leads to a master's degree as well as a "civilingenjör" degree.

The language of instruction, during the first three years of the programme is mostly Swedish; although English literature will be used. The concluding two years are taught in English.

## **Eligibility and selection**

To study at the Master of Science in Medical Engineering, the general entry requirements for higher education apply. In addition the following specific entry requirements apply: Field-specific entry requirement A8 (Physics 2, Chemistry 1, Mathematics 4). Other studies or professional experience are assessed based on the prior knowledge required. Otherwise refer to the KTH admission regulations in the KTH regulatory framework, [www.kth.se](http://www.kth.se)

## **Implementation of the education**

### **Structure of the education**

Most of the courses in the programme comprise 7.5 higher education credits, which are graded on a scale of A-E, F and Fx. The study year is normally divided into 4 study periods and, normally, two courses are taken in parallel every study period.

Current guidelines concerning study years, terms, study periods can be found in the KTH-handbook and the study handbook on the student web.

The programme is started with an introduction course in engineering studies: Information technology and methodology. In order to provide an insight into the main area, two basic courses in medicine and medical technology are given. These courses are combined with mathematics, physics, programming, and introduction technology in order to provide the necessary mathematical and technical foundation for the continued studies. The technical specialisation is chosen before the Fall term in study year 2.

Furthermore the foundation is strengthened within the different course blocks. The student takes courses in medical technology, mathematics, physics, chemistry and technology parallel with studies within the technical specialisation which he/she has chosen. Courses within economy, ethics, and the environment complement the education by giving the professional profile which makes the student attractive for the industry market.

The first three years are concluded with a specialisation project/degree project for the bachelor's degree comprising 15 higher education credits within the chosen technical area. After completing 180 higher education credits, the student can apply for a Bachelor's degree if the degree requirements are fulfilled.

During study years 4-5, the deepening within medical technology and the chosen technical specialisation continues. The studies continue until the Master's degree of 300 credits and study year 5 is concluded with a degree project of 30 higher education credits.

## **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.

Certain courses will be given at or in collaboration with Karolinska Institutet. In these courses, the grades Pass and Fail may be used.

## **Conditions for participation in the programme**

Participation requires admission to courses within the programme and course registration. Course registration is done via the personal menu at [www.kth.se](http://www.kth.se)

## **Conditions for further studies**

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.

## **Requirements from first cycle to Master's programme:**

In order to be eligible for advanced level studies within the integrated Master of Science programmes at KTH, you are required to complete 150 ECTS credits from year one through three. Of these, 110 ECTS credits must be from the year 1 and 2 curriculum. In addition to these credits, the bachelor thesis needs to be completed before Master's level studies commence.

Students who are lagging behind in their studies and do not meet the above requirements should, in consultation with the programme's Study Guidance, establish an individual study plan for the continuing studies.

It is the student's responsibility to ensure that possible course prerequisites are fulfilled before the start of a new course. Information about prerequisites can be found in the respective course plans.

## **Recognition of previous academic studies**

The student has the possibility to apply to receive credit from course(s) at another higher education institution/university within Sweden or abroad. The form to do this can be found on KTH's website. KTH's policy for recognition of previous academic studies can be found, in full, in the KTH-handbook.

## **Studies abroad**

Students in Medical Engineering have the possibility to study abroad through those contracts KTH has with other university within and beyond the EU. It is also possible to do the degree project abroad.

The deadline for application for studies abroad is around the 15th of January.

## **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.

Within the education there are requirements for the implementation of two degree project courses. The degree project in the first cycle comprises 15 higher education credits and the degree project in the second cycle comprises 30 higher education credits.

*For the degree project, the following apply:*

- It may be started after the assignment is approved by the examiner.
- It is based in the knowledge which has been acquired during the time of study and must normally be carried out during term 10.
- It must show proof of an independent work comprising theoretical and/or experimental work with a relevant written report and oral presentation.
- The instructor is appointed by the examiner.

## **Degree**

In order to complete the Degree of Master of Science in Engineering, Degree Programme in Medical Engineering successfully, passing grades in all courses which are in the student's study plan must be achieved. The study plan consists of the obligatory courses, the optional courses the student has chosen and the degree project work. The study plan must comprise at least 300 higher education credits, of which, 30 higher education credits are the degree project.

For more, see KTH's local degree ordinance in the KTH-handbook

[Appendix 1 - Course list](#)

[Appendix 2 - Programme syllabus descriptions](#)



# Appendix 1: Course list

Programme syllabus for studies starting in autumn 2019, Degree Programme in Medical Engineering (CMEDT)

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## General courses

### Year 1

#### Mandatory courses (60.0 Credits)

Code	Name	Credits	Edu. level
<a href="#">HE1200</a>	<a href="#">Electrical Principals and Measurement</a>	9.0 hp	First cycle
<a href="#">HI1200</a>	<a href="#">Computer Programming, Basic Course</a>	6.0 hp	First cycle
<a href="#">HL1200</a>	<a href="#">Engineering Introduction</a>	6.0 hp	First cycle
<a href="#">HL1201</a>	<a href="#">Medicine and Medical Engineering, Basic Course</a>	12.0 hp	First cycle
<a href="#">HL1204</a>	<a href="#">Thermodynamics, Basic Course</a>	6.0 hp	First cycle
<a href="#">SF1624</a>	<a href="#">Algebra and Geometry</a>	7.5 hp	First cycle
<a href="#">SF1625</a>	<a href="#">Calculus in One Variable</a>	7.5 hp	First cycle
<a href="#">SG1102</a>	<a href="#">Mechanics, Smaller Course</a>	6.0 hp	First cycle

#### Optional courses

Code	Name	Credits	Edu. level
<a href="#">SF0003</a>	<a href="#">Introductory Course in Mathematics</a>	1.5 fup	Pre-university level

### Year 2

#### Mandatory courses (60.0 Credits)

Code	Name	Credits	Edu. level
<a href="#">BB1010</a>	<a href="#">Introduction to Biotechnology</a>	7.5 hp	First cycle
<a href="#">HE1201</a>	<a href="#">Business Economics and Entrepreneurship</a>	6.0 hp	First cycle
<a href="#">HI1201</a>	<a href="#">Object- Oriented Programming</a>	6.0 hp	First cycle
<a href="#">HL1202</a>	<a href="#">Medical Imaging Systems</a>	9.0 hp	First cycle
<a href="#">HL2015</a>	<a href="#">Quality and Regulatory Aspects on Medical Devices</a>	3.0 hp	Second cycle
<a href="#">SF1626</a>	<a href="#">Calculus in Several Variables</a>	7.5 hp	First cycle
<a href="#">SF1923</a>	<a href="#">Probability Theory and Statistics</a>	6.0 hp	First cycle

[SH1011 Modern Physics](#)

7.5 hp First cycle

[SK1114 Electromagnetism and Waves](#)

7.5 hp First cycle

### Supplementary information

This information is based on the course list that is valid for the academic year 2019/20, and changes may occur.

## Year 3

### Mandatory courses (36.0 Credits)

Code	Name	Credits	Edu. level
<a href="#">EL1010</a>	<a href="#">Automatic Control, General Course</a>	6.0 hp	First cycle
<a href="#">HF1201</a>	<a href="#">Sustainability and Ergonomics</a>	6.0 hp	First cycle
<a href="#">HL103X</a>	<a href="#">Degree Project in Medical Engineering, First Cycle</a>	15.0 hp	First cycle
<a href="#">HL1203</a>	<a href="#">Medical Instrumentation</a>	9.0 hp	First cycle

### Conditionally elective courses

Code	Name	Credits	Edu. level
<a href="#">SF1682</a>	<a href="#">Analytical and Numerical Methods for Differential Equations</a>	11.0 hp	First cycle
<a href="#">SF1683</a>	<a href="#">Differential Equations and Transforms</a>	9.0 hp	First cycle

### Supplementary information

The 3rd year also include 15 elective credits .

This information is based on the course list that is valid for the academic year 2020/21 and changes may occur.

### Information regarding conditionally elective courses

One of the courses SF1683 or SF1682 should be taken.



## Appendix 2: Specialisations

Programme syllabus for studies starting in autumn 2019, Degree Programme in Medical Engineering (CMEDT)

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This programme has no specialisations.