



# 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 08 (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 programme comprises 300 higher education credits which corresponds to 5 years of full-time studies and is mainly in Swedish, but some courses and course elements, especially in the higher study years, are instructed in English.

The programme's level is mainly on the first level the first three years and the second level in the last two years.

The programme includes the following specialisation:

- Imaging systems
- Communication and networks
- Chemistry and material science
- Biomechanics
- Electronics and robots

## **Eligibility and selection**

For eligibility to the programme, basic eligibility and special eligibility are required in Mathematics course D, Physics course B, Chemistry course A. In each and every of these subjects, the lowest accepted grade is passed or 3.

Students who have completed at least 38 higher education credits of the obligatory courses in study year 1 in the Master of Science in Engineering programme in Medical Engineering up to the Spring term's final day are eligible to choose a technical specialisation for the coming study year. There is a limited number of places in each technical specialisation. If there are more applicants than places allow, a selection must be done. The selection of the applicant to the technical specialisations occurs according to the number of completed higher education credits and secondly to the grades of those credits.

## **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**

A condition for participating in the programme is that the student, every Spring and Fall, completes term enrolment for the coming term. This is done through "Mina Sidor" on KTH's website from the 1st to the 15th of November, and from the 1st to the 15th of May, respectively

By doing the term enrolment, the student has submitted his/her intention of studying and participating in the lectures. Only then is it possible for the student to:

- register for the term
- register for courses
- receive grades for courses
- have the possibility to receive student aid from CSN

Within the common portion of the programme, there are no optional courses. Within the specialisation, there are possibilities and conditions for optional courses and the conditions of participation in these courses will be stated by the school providing these courses.

*For studies in study year 2:*

At least 45 higher education credits must be completed before the examination period in August. Students who do not fulfil these requirements must create an individual study plan in tandem with the study guidance.

*For studies in study year 3:*

At least 90 higher education credits must be completed from study years 1 and 2 before the examination period in August. Students who do not fulfil these requirements must create an individual study plan in tandem with the study leadership.

*For studies in study year 4:*

At least 150 higher education credits must be completed from study years 1-3 before the examination period in August. Students who do not fulfil these requirements must create an individual study plan in tandem with the study leadership.

*Term enrolment and selection of courses*

The student must complete term enrolment prior to each term, via Mina Sidor, at the latest November 15th, and May 15th, respectively. The term enrolment lays the foundation for term registration. This makes it possible to register grades and provide student aid from CSN. The student who does not fulfil the conditions for being promoted to the next level must contact the study guidance.

Choice of technical specialisation occurs during the spring term of study year 1 and is completed before the fall term of study year 2.

Students who have completed at least 38 higher education credits of the obligatory courses in study year 1 in the Master of Science in Engineering programme in Medical Engineering up to the Spring term's final day are eligible to choose a technical specialisation for the coming study year. There is a limited number of places in each technical specialisation. If there are more applicants than places allow, a selection must be done. The selection of the applicant to the technical specialisations occurs according to the number of completed higher education credits and secondly to the grades of those credits.

Every student must, at the first scheduled lecture, sign a course registration's list. A student who has registered themselves in a course and has thereafter decided not to continue with the courses, must contact the course responsible teacher as soon as possible.

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**

In the programme, a degree project comprising 30 higher education credits is included. This corresponds to around 20 weeks of full-time studies.

*For the degree project, the following apply:*

- It may be started at the earliest after 240 higher education credits are completed and when courses relevant to the degree project's content has been completed.
- 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.

KTH's rules for the degree project work can be found in the KTH-handbook.

*KTH-handbook 2, page 15.1*

## **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

Degree Programme in Medical Engineering (CMEDT), Programme syllabus for studies starting in autumn 2008

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## General courses

### Year 1

#### Mandatory courses (60.0 Credits)

Course code	Course 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="#">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
<a href="#">SI1120</a>	<a href="#">Thermodynamics, Basic Course</a>	6.0 hp	First cycle

### Year 2

#### Mandatory courses (45.0 Credits)

Course code	Course name	Credits	Edu. level
<a href="#">BB1010</a>	<a href="#">Introduction to Biotechnology</a>	7.5 hp	First cycle
<a href="#">HF1200</a>	<a href="#">Environmental Science</a>	6.0 hp	First cycle
<a href="#">HL1202</a>	<a href="#">Medical Imaging Systems</a>	9.0 hp	First cycle
<a href="#">SF1626</a>	<a href="#">Calculus in Several Variable</a>	7.5 hp	First cycle
<a href="#">SH1011</a>	<a href="#">Modern Physics</a>	7.5 hp	First cycle
<a href="#">SK1111</a>	<a href="#">Electromagnetism and Waves</a>	7.5 hp	First cycle

### Year 3

## Mandatory courses (60.0 Credits)

Course code	Course name	Credits	Edu. level
<a href="#">DD1320</a>	<a href="#">Applied Computer Science</a>	6.0 hp	First cycle
<a href="#">EL1000</a>	<a href="#">Automatic Control, General Course</a>	6.0 hp	First cycle
<a href="#">HL102X</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
<a href="#">HL2015</a>	<a href="#">Quality and Regulatory Aspects on Medical Devices</a>	3.0 hp	Second cycle
<a href="#">ME1004</a>	<a href="#">Industrial Management, Basic Course</a>	6.0 hp	First cycle
<a href="#">SF1629</a>	<a href="#">Differential Equations and Transforms II</a>	9.0 hp	First cycle
<a href="#">SF1901</a>	<a href="#">Probability Theory and Statistics</a>	6.0 hp	First cycle

## Year 4

### Supplementary information

Is the same as the study plan for the Master's programme in Medical Engineering





## Appendix 2: Specialisations

Degree Programme in Medical Engineering (CMEDT), Programme syllabus for studies starting in autumn 2008

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This programme has no specialisations.