



Programme syllabus

[An accessible version of the syllabus can be found in the Course and programme directory.](#)

Degree Programme in Medical Technology 180 credits

Högskoleingenjörsutbildning i medicinsk teknik

Valid for students admitted to the education from autumn 16 (HT - Autumn term; VT - Spring term).

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

Programme objectives

The education program Medical engineering is an interdisciplinary program that is carried out in close cooperation with Karolinska Institutet (KI). In this program, the same basic technical and scientific courses as in the program Electrical engineering is studied, but instead of taking advanced courses the student broadens his/her education by taking courses in anatomy, physiology and medical engineering, like Medical Measurement and Monitoring, Medical Imaging Systems and Clinical Engineering.

The aim is to educate engineers that have both basic medical and technical knowledge and thereby can be a link between the industry and physicians and health-care personnel, either at the hospitals or in the industry that produces medical engineering equipment for example with operation, purchase, maintenance, development or education.

With this knowledge and by learning to use technical and scientific sources of information the education program should give good basis for continued personal development and the "lifelong learning" both within the own and within new subject areas.

In addition to the aims that are specified in The Higher Education Ordinance should an engineer that has been examined from Medical engineering at KTH show:

Knowledge and understanding

- basic knowledge within computer technology/software development and electronics and understanding basic concept within the medical field
- knowledge of the organisation and conditions of the care and relevant legislation
- broad knowledge and in certain areas advanced knowledge within medical technology
- basic knowledge in mathematics and ability to critically and systematically use knowledge to modulate, simulate or evaluate developments on the basis of relevant information.

Skills and abilities

- ability to independently identify, formulate and solve problems • ability to handle and shape products, processes and system from both technical, ethical and economical aspects • ability to work in multicultural and multi-disciplinary project groups consisting of engineers as well as non-engineers and be able to communicate his/her results

Ability to make judgements and adopt a standpoint

- knowledge of products and the design of systems to be best adapted to man's wish and needs and considering environmental aspects
- responsibility and feeling for ethics regarding technical, medical, economical, environmental and social issues.
- consciousness about how own personal values and positions influence definition and assessments of technical and medical problems

Extent and content of the programme

The education comprises 180 credits, which corresponds to 3 years' full-time studies. The education is for first-cycle studies. The teaching is almost entirely in Swedish, but a large part of the course literature and occasional lectures are in English.

Eligibility and selection

For admission to the education, general entry requirements as well as specific entry requirements in Mathematics D, Physics B and Chemistry A are required. In each of the subjects at least the grade Passed or 3 is required.

Applicants to Bachelor of Science in Engineering programmes are selected both on the basis of their grades and based upon the results of an entrance test. Admission for two-thirds of the places is based on grades, and the remaining places are on the basis of an entrance test. If the merits of an applicant are unable to be assessed using this selection process, special testing may be performed.

For further information on eligibility and selection, see http://www.kth.se/studies/programmes/swedish-programmes/admissions-procedure-1.9578?l=en_UK

Implementation of the education

Structure of the education

Structure of the education

Most of the courses in the program comprise 7,5 credits and are graded in a grading scale with seven steps A-E, F and Fx. The academic year is normally divided into 4 study periods, and usually two courses are taken in parallel in each study period. Teaching - like the examination formats vary from course to course. Normally, a part of the course consists of lectures that give a first contact with concept and theories. Practical assignments and laboratory sessions reinforce the understanding of the theoretical relationships. Project work according to model from the industry has an essential role in the education. Here, training is given in how to in groups take on reality based assignments in an engineering way.

To create a whole in the education, the connection between the courses is emphasised, both within each school year and between the school years. The education is completed during last the semester with a degree project that most often is carried out with an employer outside the school.

Semester 1

The education is organised so that one starts with taking one semester of medical courses i.e. Biological chemistry and Anatomy, physiology and pathology. These courses are taught by teachers from Karolinska Institutet and are given in Flemingsberg. In parallel with these the course Engineering and Information Skills is taken. The course gives the basic engineering tools such as computer science, presentation technique and information retrieval. In the course the students may also test to work in project form by in small groups finding as much facts as possible about a medical engineering device or method and then present these in writing and orally.

Semester 2 and 3

The following two the semesters mathematics and basic engineering courses like circuit theory and programming are studied. These courses should give a solid technical basis and give understanding of the technical part of medical engineering. These courses are given in Haninge.

Semester 4, 5 and 6

The last three semesters advanced courses in electrical engineering as well as control systems and EMC-electronics are studied. The later course should give understanding of the influence of electronic devices from and on the surrounding environment. In the project course Electronic design, the student may apply his/her electronic and computer skills by carrying out a practical design. One also reads the four Medical engineering courses Technology in Intensive Care and Surgery, Medical Measurement and Monitoring, Medical Imaging Systems and Clinical Engineering. In these courses, the student comes in contact with more specific applications of electronics. Examples of measurement applications are ECG, EEG and ultrasound and examples of imaging systems are X-ray, MRI and PET-scanning. The last semester also contains an elective course that can be used to advanced studies within some computer, electronic or medical engineering field or to acquire entry requirements for higher studies on master's level.

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

The conditions differ from those that normally are applied for engineering education at KTH.

For studies on semester 2 it is required that those who have started their studies with an extra semester of basic courses on a high school level have finished and passed all those courses or that equivalent entry requirements have been acquired in a different way. If the student does not satisfies this he/she will not be transferred to semester 2 and has no right to take courses within the program.

For studies on semester 4, it is required that the following courses are completed and passed:

Engineering and Information Skills 7,5 cr

Anatomy, Physiology and Pathology 15 cr

Digital Electronics 6 cr

Linear Algebra and Calculus in One Variable 10 cr

Electrical Principals 7 hp

For the students that do not satisfy this requirement an individual study plan should be established in consultation with a student counselor .

The Course enrolment/semester registration and choice of courses

At the latest November 15th for the spring semester and May 15th for the autumn semester should all the students make a course enrolment using My pages. The course enrolment underlie semester registration. This facilitates registration of grades and payment of student finance from CSN. The student that does not satisfy the requirements for transfer to a higher academic year should contact his/her student counselor.

Before the autumn semester in school year 3, the student should where appropriate choose course.

Course registration

Each student should at the first scheduled lecture sign a course registration list The student who has registered on a course and after that decides not to complete the course should as soon as possible report this to the course coordinator.

It is the student's responsibility to make sure that possible prerequisites from earlier courses within the education program have been achieved before a new course is taken. Information about entry requirements can be found in the course syllabus for each course.

Recognition of previous academic studies

According to the Swedish Higher Education Ordinance, a student who has gone through certain first-cycle study courses and study programmes with a passing result has the right to have such credit recognised for a corresponding course of education at another institution of higher education. The Director of Undergraduate Studies (Grundutbildningsansvarig) will make the decisions concerning recognition of entire or parts of courses. The application for recognition should be submitted to the programme office using the form intended for that purpose.

Studies abroad

Students at the School for technology and health (STH) have the opportunity to locate an academic year of studies at a foreign higher education institution that KTH cooperates with, without needing to pay the course fees that otherwise are needed for foreign students. Exchange studies can take place during the third school year. It is also possible to carry out the degree project abroad. Information about studies abroad is given by the administrator for internationalisation who also informs about current dates for application. Application forms can be received from the student counsellor. The studies abroad can after assessment be included as a part of the bachelor degree in medical engineering. The outgoing student should together with the school establish a so-called Learning Agreement that implies an advance notification of recognition of the exchange studies. The studies

are normally carried out in the language of the country/the region. There are possibilities for the student that becomes admitted to an exchange programme in German -, French -, Spanish - and Italian speaking countries to follow a preparing language course before the regular semester starts.

Degree project

In the education, a degree project of 15 credits is included. It implies about 10 weeks of full-time studies. See further: Guidelines for degree projects, the School for technology and health

The following applies for the degree project:

It may be started, at the earliest, after 120 achieved HE credits and when final grades is obtained in relevant courses that concern the contents of the degree project. It may be started when the assignment has been approved by the examiner. It is based on the knowledge that has been acquired during the education and should normally be carried out during semester 6. It should constitute proof of an independent work comprising theoretical and/or experimental work with accompanying report writing and oral presentation. Supervisor is appointed by the examiner.

Degree

To graduate with the degree "Bachelor of Science in Engineering, degree programme in Medical Technology" it is required that the student has passed all courses that are included in the student's study plan. The study plan consists of the compulsory courses, the elective courses that the student has chosen to take and the degree project. The study plan should comprise at least 180 HE credits.

Course that overlaps from the point of view of content one or several other courses in the program can not be included within the scope of the 180 credits that underlie the degree.

To get the degree, the student should apply using a form.

KTH's local degree ordinance can be found in its entirety here: http://intra.kth.se/regelverk/utbildning-forskning/grundutbildning/examina/lokala-foreskrifter-for-examina-pa-grundniva-och-avancerad-niva-lokal-examensordning-1.27227?l=en_UK

Appendix 1 - Course list

Appendix 2 - Programme syllabus descriptions



Appendix 1: Course list

Degree Programme in Medical Technology (TIMEL)

General courses

Year 1

Mandatory courses (60.0 Credits)

Code	Name	Credits	Edu. level
HE1026	Digital Electronics	6.0 hp	First cycle
HE1027	Electrical Principals	7.0 hp	First cycle
HE1041	Microcomputer Engineering, Project Course	11.0 hp	First cycle
HF1008	Linear Algebra and Calculus in One Variable	10.0 hp	First cycle
HI1024	Computer Programming, Basic Course	8.0 hp	First cycle
HL1200	Engineering Introduction	6.0 hp	First cycle
HL1201	Medicine and Medical Engineering, Basic Course	12.0 hp	First cycle

Optional courses

Code	Name	Credits	Edu. level
HF0009	Introduction to Mathematics	1.5 fup	Pre-university level
HF0010	Introduction to Computer Studies	1.5 fup	Pre-university level

Year 2

Mandatory courses (63.0 Credits)

Code	Name	Credits	Edu. level
HE1019	EMC-Electronics	6.0 hp	First cycle
HE1030	Analog Electronics	8.0 hp	First cycle
HE1037	Data- and Telecommunication	10.0 hp	First cycle
HE1201	Business Economics and Entrepreneurship	6.0 hp	First cycle
HF1011	Signals, Systems and Transforms	8.0 hp	First cycle
HF1012	Mathematical Statistics	6.0 hp	First cycle
HL1014	Clinical Engineering	6.0 hp	First cycle
HL1015	Engineering in Intensvie Care and Surgery	6.0 hp	First cycle
HL1016	Medical Measurement and Monitoring	7.0 hp	First cycle

Year 3

Mandatory courses (33.0 Credits)

Code	Name	Credits	Edu. level
HE1039	Control Engineering	6.0 hp	First cycle
HF1201	Sustainability and Ergonomics	6.0 hp	First cycle
HL1013	Medical Imaging Systems	6.0 hp	First cycle
HL101X	Degree Project in Medical Technology, First Cycle	15.0 hp	First cycle

Conditionally elective courses

Code	Name	Credits	Edu. level
HL2032	Medical Engineering, Project Course	9.0 hp	Second cycle
HL2041	Sports Technology	9.0 hp	Second cycle



Appendix 2: Specialisations

Degree Programme in Medical Technology (TIMEL)

This programme has no specialisations.