



Programme syllabus

Degree Programme in Biotechnology
Civilingenjörsutbildning i bioteknik
300.0 credits

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

Knowledge and understanding

To receive a Degree of Master of Science in Engineering, Degree Programme in Biotechnology, the student should show:

- skills and understanding of fundamental, scientific and technical aspects, of biotechnology
- advanced knowledge and insight into the state-of-the-art research and development in biotechnology
- a broad knowledge in life sciences including mathematics, chemistry and physics
- in-depth knowledge on advanced technical processes or biological systems in selected areas of biotechnology

Skills and abilities

To receive a Degree of Master of Science in Engineering Degree Programme in Biotechnology, the students should demonstrate their ability to:

- solve, create, develop, analyze, or evaluate complex biotechnical systems, processes or challenges in an independent and critical manner.
- plan, implement and evaluate experiments with a scientific approach and analytical thinking
- design products, processes and systems with regard to human and societal pre-requisites and needs, and a sustainable development of the economy, society and environment.

- communicate ideas, results and conclusions, orally and in writing, to scientific as well as public recipients with knowledge-based, precise and adequate arguments and terminology.
- work in teams and skills in project management

Ability to make judgements and adopt a standpoint

To receive a Degree of Master of Science in Engineering in Biotechnology, Degree Programme in Biotechnology, the students should demonstrate an ability to:

- take a stand on issues of ethical nature in biotechnology, including areas of research and innovation.
- make scientific judgments that are responsible with regard to ethics, economy, the nature and environment, and the society.
- insightfully consider the possibilities and shortcomings of technologies in biotech applications, including their use in the society and aspects of economy, environment, and work environment.
- identify ones own need for continued education and competence development

Extent and content of the programme

The Degree Programme in Biotechnology is composed of 300 credits, which at the normal study speed corresponds to 5 years of full-time studies (10 semesters).

The first cycle of the programme (three years, 180 credits) can, if the student applies for it, be finished with a Degree of Bachelor of Science. The second cycle (two years, 120 credits) is studied according to one of four selectable masters programmes and lead to a degree of Master of Science in Engineering in Biotechnology.

The masters programme within the Degree programme in Biotechnology are:

- Industrial and Environmental Biotechnology
- Medical Biotechnology
- Macromolecular Materials *
- Molecular Science and Engineering **

**To obtain the Degree of Master of Science in Biotechnology two of these courses must be taken; BB2460 Biocatalysis 7,5 credits, BB2020 Molecular Enzymology 7.5 credits, BB2425 Glycobiotechnology 7.5 credits,*

***To obtain the Degree of Master of Science in Biotechnology two of these courses must be taken; BB2460 Biocatalysis 7,5 credits and BB2020 Molecular Enzymology 7.5 credits*

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

Language of instruction

The language of instruction, during the first three years of the programme is mostly Swedish; although English literature may be used. Courses of the concluding two years are given in English. For each course the language of instruction is found in the course syllabus on the KTH student web.

Eligibility and selection

In order to be accepted to the Degree programme in Biotechnology, general eligibility for university studies in Sweden, i.e. completed upper secondary education including documented proficiency in Swedish corresponding to Swedish 3 / Swedish as second language 3 and English corresponding to English 6. as well as the following requirements must be met:

Completed upper-secondary school before 1 July 2011 and adult education at upper-secondary level before July 1, 2012

Area of competence 9 *

Mathematics E

Physics B

Chemistry A

All with at least a grade of P (Pass) or 3.

Completed upper-secondary from 1 July 2011 and adult education at upper-secondary level as of July 1, 2012 (Gy2011)

Area of competence A9 *

Specific requirements:

Physics 2, Chemistry 1 and Mathematics 4. All with at least a grade of P (Pass).

* For more information about “area of competence 9”, see www.hsv.se

For eligibility requirements and selection guidelines, see KTH’s admission policy see www.kth.se

Implementation of the education

Structure of the education

Academic year

The KTH academic year is 40 weeks, divided into four periods. The study periods correspond to about seven weeks. Each study period is followed by an examination period. For details about the structure of the academic year see; "student at kth/timetables" at www.kth.se.

First cycle

The first three years consists of compulsory courses in natural sciences to provide fundamental knowledge and skills. The Study programme contains courses in Biotechnology, Chemistry, Mathematics and Engineering skills but it also includes two conditionally elective courses. The cycle also contains two independent projects and a diploma at the level of Bachelor of Science, in Biotechnology.

The course curriculum is presented in appendix 1.

Second cycle

During the second cycle, study year 4 and 5, one of the following master programmes are studied;

Industrial and Environmental Biotechnology, Medical Biotechnology, Macromolecular Materials, Molecular Science and Engineering.

The Master selection is done 1-15 May.

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

Participation requires admission to courses within the programme and course registration. Course registration is done via the personal menu at www.kth.se

If a student registers for a course and then decides to not continue, the student must report this as soon as possible.

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.

Application for admission to courses will be made at:

- 1th-15th of May for the fall term.
- 1th-15th of November for the spring term.

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.

Selecting a masters programme

Industrial and Environmental Biotechnology

You should study the conditionally elective courses BB1070 Genetics and KD1270 Organic Chemistry, Basic Concepts and Practice 2.

Medical Biotechnology

You should study the conditionally elective course BB1070 Genetics.

Macromolecular Materials

You should study the conditionally elective KD1070 Molecular Structure.

Molecular Science and Engineering

You should study the conditionally elective course D1070 Molecular Structure and KD1270 Organic Chemistry, Basic Concepts and Practice 2.

Recognition of previous academic studies

Students have the opportunity to apply for recognition of their results from the course or courses at another college / university within or outside the country. The form is available on the KTH website. The application for accreditation submitted to the study advisor at the BIO student office.

The complete KTH policy for recognition of previous academic studies is found in the KTH regulations at www.kth.se.

Studies abroad

Students at the Degree programme, in Biotechnology have the opportunity to study one or two semesters abroad through agreements KTH has with universities within and outside the EU. Exchange studies shall preferentially be conducted during the second cycle. It is also possible to make the final degree project abroad.

For more information see; "student at kth/during a program/study abroad" at www.kth.se or contact the international coordinator at students office.

Degree project

Degree project, first level

The diploma work done in grade 3 is a thesis for a Degree of Bachelor of Science conducted in a course of 15 credits.

The degree project is the final part of the first level education. The project work may begin when special admission requirements for the course are fulfilled.

Degree project, advanced level

In the programme a final diploma work is done, i.e. a thesis for the Degree of Master of Science in Engineering/Master of Science (120 credits) corresponding to 30 credits.

The degree project is the final part of the second level education. The project work may begin when special admission requirements for the course are fulfilled.

For further information see KTH comprehensive rules and guidelines for thesis 30 credits at www.kth.se

Degree

Degree Name

Civilingenjörsexamen

Degree of Master of Science in Engineering, Degree Programme in Biotechnology

Conditions for the Degree of Master of Science in Engineering 300 credits

The Master of Science in Engineering degree is received after completing all the courses at the first and second cycles of education at the degree programme in biotechnology according to the programme specifications.

Students taking the master programs Macromolecular Materials or Molecular Science and Engineering, should have at least 15 credits of biotechnology courses at advanced level.

Application for graduation Students are requested to apply for the degree through the web service by logging into Personal menu/Application for degrees. For further information see www.kth.se

It is possible to apply for the following degrees: Degree of Master of Science in Engineering; Degree Programme in Biotechnology, Degree of Bachelor of Science and Degree of Master of Science.

For further information see; "Local regulation for qualifications at first and second cycle" at www.kth.se

[Appendix 1 - Course list](#)

[Appendix 2 - Programme syllabus descriptions](#)



Appendix 1: Course list

Programme syllabus for studies starting in autumn 2019, Degree Programme in Biotechnology (CBIOT)

General courses

Year 1

Mandatory courses (64.5 Credits)

Code	Name	Credits	Edu. level
BB1030	Microbiology	9.0 hp	First cycle
BB1150	Biochemistry 1	7.5 hp	First cycle
BB1160	Eucaryotic Cell Biology	7.5 hp	First cycle
BB1170	The Engineer in Focus	6.0 hp	First cycle
BB1190	Gene Technology	7.5 hp	First cycle
KD1020	Introductory Chemistry	6.0 hp	First cycle
KD1230	Organic Chemistry, Basic Concepts and Practice	6.0 hp	First cycle
KE1180	Introduction to Chemical Engineering	7.5 hp	First cycle
SF1625	Calculus in One Variable	7.5 hp	First cycle

Optional courses

Code	Name	Credits	Edu. level
KE0110	Introductory Course in Chemistry	1.5 fup	Pre-university level
SF0003	Introductory Course in Mathematics	1.5 fup	Pre-university level

Supplementary information

Study year 1 consists of mandatory courses.

Year 2

Mandatory courses (60.0 Credits)

Code	Name	Credits	Edu. level
	The Engineer in Focus		

BB1170 <i>Continues from year one</i>	6.0 hp	First cycle
BB1200 <i>Analysis of Biomolecules</i>	6.0 hp	First cycle
BB1210 <i>Purification of Biomolecules</i>	6.0 hp	First cycle
BB1220 <i>Project in Biotechnology</i>	6.0 hp	First cycle
BB1230 <i>Biochemistry 2</i>	6.0 hp	First cycle
KD1510 <i>Chemical Equilibrium</i>	6.0 hp	First cycle
SF1524 <i>Basic Numerical Methods and Programming</i>	7.5 hp	First cycle
SF1624 <i>Algebra and Geometry</i>	7.5 hp	First cycle
SK1150 <i>Fundamental Physics I</i>	9.0 hp	First cycle

Conditionally elective courses

Code	Name	Credits	Edu. level
KD1270	Organic Chemistry, Basic Concepts and Practice 2	7.5 hp	First cycle
SF1626	Calculus in Several Variables	7.5 hp	First cycle

Supplementary information

This is a preliminary list of courses for study year 2 for those who started the program 2019. There might be changes.

Study year 2 consists of mandatory courses and a conditionally elective course.

Note that the schedule for study year 2 is adapted for the courses KD1270 - Organic Chemistry, Basic Concepts and Practice 2 and SF1626 - Calculus in Several Variable.

Information regarding conditionally elective courses

Three courses of the conditionally elective courses must be studied under study year 2 and study year 3. See the list below

- KD1270 Organic Chemistry, Basic Concepts and Practice 2
- SF1626 Calculus in Several Variable
- KE1185 Chemical Engineering Systems
- BB1000 Programming in Python
- BB1070 Genetics
- KD1070 Molecular Structure

You must study KD1270 - Organic Chemistry, basic concepts and practice 2 as one of the conditionally elective courses during study year 2 or 3 or use the free elective credits at the master program to be eligible to take the course KD2310 - Advanced Organic Chemistry.

Year 3

Mandatory courses (54.0 Credits)

Code	Name	Credits	Edu. level
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BB103X Degree Project in Biotechnology, First Cycle	15.0 hp	First cycle
BB1170 The Engineer in Focus <i>Continues from study year 1 and study year 2</i>	6.0 hp	First cycle
BB1220 Project in Biotechnology <i>Continues from study year 2</i>	6.0 hp	First cycle
BB1300 Cultivation Technology	7.5 hp	First cycle
KD1500 Physical Biochemistry	7.5 hp	First cycle
SF1911 Statistics for Bioengineering	6.0 hp	First cycle
SI1410 Basic Modeling in Biotechnology	6.0 hp	First cycle

Conditionally elective courses

Code	Name	Credits	Edu. level
BB1000	Programming in Python	7.5 hp	First cycle
BB1070	Genetics <i>Mandatory for master programme TIMBM and TMBIM</i>	6.0 hp	First cycle
KD1070	Molecular Structure <i>Mandatory for master programme TMMMM and TMVTM</i>	6.0 hp	First cycle
KE1185	Chemical Engineering Systems	7.5 hp	First cycle

Supplementary information

This is a preliminary list of courses for study year 3 for those who started the program 2019. There might be changes.

Study year 3 consists of mandatory courses and a conditionally elective course.

Note that the schedule for study year 2 is adapted for the courses KE1185 Chemical Engineering Systems and BB1000 Programming in Python.

Information regarding conditionally elective courses

Three courses of the conditionally elective courses must be studied under study year 2 and study year 3. See the list below

- KD1270 Organic Chemistry, Basic Concepts and Practice 2
- SF1626 Calculus in Several Variable
- KE1185 Chemical Engineering Systems
- BB1000 Programming in Python
- BB1070 Genetics
- KD1070 Molecular Structure

You must study KD1270 - Organic Chemistry, basic concepts and practice 2 as one of the conditionally elective courses during study year 2 or 3 or use the free elective credits at the master program to be eligible to take the course KD2310 - Advanced Organic Chemistry.

The schedule for study year 3 is adapted for the courses KE1185 Chemical Engineering Systems and BB1000 Programming in Python

Year 4

Supplementary information

During study year 4 and 5 one of the four Masters programme should be taken:

- Master - Industrial and Environmental Biotechnology
- Master - Medical Biotechnology
- Master - Macromolecular Materials
- Master - Molecular Science and Engineering

Year 5

Supplementary information

During study year 4 and 5 one of the four Masters programme should be taken:

- Master - Industrial and Environmental Biotechnology
- Master - Medical Biotechnology
- Master - Macromolecular Materials
- Master - Molecular Science and Engineering

Study year 5 ends with a degree project, second level, 30 credits.

Master, Industrial and Environmental Biotechnolgy (IMB)

Master, Medical Biotechnology (MBI)

Master, Macromolecular Materials (MMM)

Master, Molecular Science and Engineering (MVT2)



Appendix 2: Specialisations

Programme syllabus for studies starting in autumn 2019, Degree Programme in Biotechnology (CBIOT)

Master, Industrial and Environmental Biotechnology (IMB)

The overall goal of this program is that students will gain the insight and knowledge needed to use biotechnology to produce chemicals, materials and energy and thus assist in creating a sustainable society. The program provides a deeper understanding of the metabolic, physiological and genetic basis for the use of enzymes and microorganisms in biotechnological production systems. Understanding of the global pollution and destruction of the environment is an important part of education and to contribute to an improvement in these areas is a major challenge for new engineering graduates. One important tool is an efficient use of biotechnological methods to understand and solve this problem.

For more detailed information about the Master programme (Two Years), Industrial and Environmental Biotechnology, see "student at kth/ course and programme directory" at www.kth.se.

Master, Medical Biotechnology (MBI)

The program aims to provide depth in the fields of biotechnology, in which molecular techniques play a central role, with particular emphasis on medical applications. The goal is to provide the prospective civil engineers in biotechnology unique expertise in the border area, chemistry, biology and medicine and provide a high level of competitiveness in the Swedish and foreign labor in the pharmaceutical and biotechnology industries as well as in research. The program includes courses in genomics and proteomics, which contains a large number of technical methods for analyzing cell activity on DNA, RNA and protein level. Bioinformatics provides an insight into how the huge amounts of data produced can be handled by computers. The program also includes courses that provide knowledge about the structure of biomolecules can be determined and how the process looks to develop drugs from the first discovery of an active molecule.

For more detailed information about the Master programme (Two Years), Medical Biotechnology, see "student at kth/ course and programme directory" at www.kth.se.

Master, Macromolecular Materials (MMM)

To obtain the Degree of Master of Science in Engineering, Degree Programme in Biotechnology, the student must take 2 of these courses;

BB2460 Biocatalysis, 7,5 credits

BB2020 Molecular Enzymology 7.5 credits

BB2420 Glycobiology and Carbohydrate Technology, 7.5 credits

For more detailed information about the Master programme (Two Years), Macromolecular Materials, see "student at kth/ course and programme directory" at www.kth.se.

Master, Molecular Science and Engineering (MVT2)

To obtain the Degree of Master of Science in Engineering, Degree Programme in Biotechnology, the student must take these courses;

BB2460 Biocatalysis, 7,5 credits

BB2020 Molecular Enzymology 7.5 credits

For more detailed information about the Master programme (Two Years), Molecular Science and Engineering, see "student at kth/ course and programme directory" at www.kth.se.