



Programme syllabus

Degree Programme in Biotechnology
Civilingenjörsutbildning i bioteknik
300.0 credits

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

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 terms).

The first three years of the programme (180 credits) is in the first cycle and can, if the student applies for it, be finished with a Degree of Bachelor of Science. The final two years (120 credits) are studied at one of the masters programme second cycle that can be selected at the degree programme in Biotechnology and leading to an MSc in Biotechnology / MSc of selected masters programme

The selected masters programme which can lead to an MSc in Biotechnology:

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

**To obtain the Degree of Master of Science in Biotechnology Engineering, 2 of these courses must be taken; BB2460 Biocatalysis 7,5 credits, BB2020 Molecular Enzymology 7.5 credits, BB2420 Glycobiology and Carbohydrate Technology 7.5 credits,*

***To obtain the Degree of Master of Science in Biotechnology Engineering, 2 of these courses must be taken; BB2460 Biocatalysis 7,5 credits and BB2020 Molecular Enzymology 7.5 credits*

Language of instruction

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 courses are given in English. For each course the language of instruction is found in the course syllabus on the KTH student web site.

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 courses aiming at giving a broad basis of knowledge and skills for an engineer within the field of Biotechnology. The Study programme contains courses in Biotechnology, in Chemistry, in Mathematics, Engineering skills but it also includes two elective courses, where it is possible to either broaden the scope of studies, or go in depth. The first three years includes also two independent projects and a concluding bachelors level diploma work in Biotechnology.

Recommended free elective courses; BB1000 Programming in Python , KD1270 Organic Chemistry, Basic Concepts and Practice 2, KE1185 Chemical Engineering Systems, SF1626 Calculus in Several Variable or language courses.

After completion of 180 credits the student may apply for the Degree of Bachelor of Science if he /she fulfils the national degree requirements.

Second cycle

Second cycle courses are given intend to give professional skills. During study year 4 and 5 one of these master programme are studied;

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

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

Semester registration

The student must register to the semester via the personal menu. Semester registration is required in order for you study results to be registered and for CSN to distribute student aid.

Course Selection

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.

with student kth.se account via universityadmissions.se

Course registration

Registration for a course is done on the web via "personal menu". Registration to a course requires acceptance to the course in LADOK.

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

Conditions for being promoted to the next level

The following promotion requirements apply in order to participate in the next level of the education.

Requirements for promotion from study year 1 to study year 2:

A total of at least 45 credits from study year 1 to be completed.

Requirements for promotion from study year 2 to study year 3:

A total of at least 90 credits from study years 1 and 2 must be completed at least 50 credits from study year 1.

Requirements for promotion from study year 3 to study year 1 at a Masters Programme:

A total of at least 150 credits from study years 1-3 must be completed, and at least 110 credits from study year 1-2, and a degree project, first level.

The course KD1270 Organic Chemistry, basic concepts and practice 2 is recommended to be taken as one of the free elective courses if the student will study the master programme Industrial and Environmental Biotechnology TIMBM or the master program Molecular Science and Engineering TMVTM.

Requirements for promotion from study year 1 at a Masters Programme to study year 2:

In addition to what applies for promotion to grade 2, at least 45 credits from study year 1 must be completed.

Students who have not fulfilled the above requirements must consult with their study advisor to construct an individual study plan for the continuation of studies.

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 is appropriate study year 1 and 2 in second cycle. It is also possible to make the thesis 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***

In the programme a project work is done in grades 3, a thesis for a Degree of Bachelor of Science which is a course of 15 credits.

To start the degree project, first level, at least 120 credits, must be completed. For further information see the syllabus of the degree project.

Degree project, advanced level

In the programme a project work is done, a thesis for the Degree of Master of Science in Engineering /Master of Science (120 credits) which is a course of 30 credits. To being working on the thesis, the student must have completed at least 240 higher education credits in the programme.

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

Degree

Application for graduation

Students have the opportunity to apply for the following degrees: Degree of Bachelor of Science and Degree of Master of Science in Engineering, Degree Programme in Biotechnology. Students are also able to request for Master of Science (120 credits) if the requirements of this qualification is met.

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

Conditions for the Degree of Bachelor of Science 180 credits

The Degree of Bachelor of Science is received if the student applies for graduation after the completion of the grade 3 and fulfils the national degree requirements and completed all courses within the program corresponding to 180 credits.

Degree Name

Teknologie kandidatexamen
Degree of Bachelor of Science

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

The Master of Science in Engineering degree is received after completing the programme. The programme is formed so that the student fulfils the national degree requirements and has completed courses corresponding to 300 credits, of which

- mathematical-natural scientific courses of at least 45 credits , and, in addition, at least 180 credits (including 30 credits of degree project work) in the subjects central to the technical area
- at least 90 credits in the second cycle, whereof at least 60 credits (including 30 credits of degree project work) in the subjects central to the technical area. To obtain Degree of Master of Science in Engineering, courses equivalent to at least 15 credits within Biotechnology, the subject central to the technical area, at advanced level, must be read.

Degree Name

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

Conditions for Degree of Master of Science (Two Years) 120 credits.

Degree of Master of Science (Two Years) is received after completing the programme. The programme is formed so that the student fulfils the national degree requirements and has completed courses corresponding to 120 credits, of which

- at least 90 credits in the second level, whereof at least 60 credits (including 30 credits of degree project work) in the subjects central to the technical area

Within the master's programs, the mandatory, recommended, and the conditionally elective courses must correspond to at least 105 credits. The remaining number of credits up to 120, the student can choose freely, but those should be relevant for the profession as an engineer.

Degree Name

Degree of Master of Science (120 credits)

Teknologie masterexamen

The introductory courses may not be included in the Degree.

Reference to KTH guidelines (KTHs regulations), local degree ordinance for degrees at first cycle and advanced cycle.

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

Degree Programme in Biotechnology (CBIOT), Programme syllabus for studies starting in autumn 2016

General courses

Year 1

Mandatory courses (64.5 Credits)

Course code	Course 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

Course code	Course 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)

Course code	Course name	Credits	Edu. level
BB1170	The Engineer in Focus	6.0 hp	First cycle
BB1200	Analysis of Biomolecules	6.0 hp	First cycle
BB1210	Purification of Biomolecules	6.0 hp	First cycle
BB1220	Project in Biotechnology	6.0 hp	First cycle
BB1230	Biochemistry 2	6.0 hp	First cycle
KD1510	Chemical Equilibrium	6.0 hp	First cycle
SF1524	Basic Numerical Methods and Programming	7.5 hp	First cycle
SF1624	Algebra and Geometry	7.5 hp	First cycle
SK1150	Fundamental Physics I	9.0 hp	First cycle

Recommended courses

Course code	Course 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 2016. There might be changes.

Study year 2 consists of mandatory courses and an elective course. The course BB1170 continues från study year 1.

Recommended free elective courses;

At least two courses of the six 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

Language course

You must study KD1270 Organic Chemistry, basic concepts and practice 2 as one of the free 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)

Course code	Course name	Credits	Edu. level
BB103X	Degree Project in Biotechnology, First Cycle	15.0 hp	First cycle
BB1170	The Engineer in Focus Continues from study year 1 and study year 2	6.0 hp	First cycle
BB1220	Project in Biotechnology Continues from study year 2	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

Course code	Course name	Credits	Edu. level
BB1070	Genetics	6.0 hp	First cycle
KD1070	Molecular Structure	6.0 hp	First cycle

Recommended courses

Course code	Course name	Credits	Edu. level
BB1000	Programming in Python	7.5 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 2016. There might be changes.

Study year 3 consists of mandatory courses, elective course and ends with a degree project, first level. The course BB1170 continues from study year 1 and 2. The course BB1220 continues from study year 2.

Recommended free elective courses;

KD1270 Organic Chemistry, Basic Concepts and Practice 2
 Sf1626 Calculus in Several Variable
 KE1185 Chemical Engineering Systems
 BB1000 Programming in Python
 Language course

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 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:

Industrial and Environmental Biotechnology

Medical Biotechnology

Macromolecular Materials

Molecular Science and Engineering

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

Master, Industrial and Environmental Biotechnology (IMB)

Master, Medical Biotechnology (MBI)

Master, Macromolecular Materials (MMM)

Master, Molecular Science and Engineering (MVT2)



Appendix 2: Specialisations

Degree Programme in Biotechnology (CBIOT), Programme syllabus for studies starting in autumn 2016

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.