



Programme syllabus

Degree Programme in Biotechnology
Civilingenjörsutbildning i bioteknik
300.0 credits

Valid for students admitted to the education from autumn 12 (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, the students should:

- demonstrate knowledge and skills in basic scientific and technical subjects that are of importance for Biotechnology and Chemistry
- be able to use information and communicate with experts in the related areas of Biotechnology such as physics, chemistry, biology and medicine
- demonstrate knowledge of biological and chemical processes at the molecular, cellular and organism level and to assess the applicability of the models used in different contexts
- show significantly advanced knowledge and understanding of current research and development in any part of biotechnology
- demonstrate some knowledge of Swedish and international Biotechnology industry

Skills and abilities

To receive a Degree of Master of Science in Engineering, the students should:

- demonstrate the ability to develop biotechnical products and processes by applying a systematic thinking in terms of raw materials, energy, security, environment, economy, human conditions and needs, and goals of society for sustainable development
- demonstrate the ability of a scientific approach and analytical thinking and the ability to plan, implement and evaluate experiments

- show a good understanding of methods and techniques that allow modern Biotechnology
- demonstrate the ability to analyze, evaluate and execute the impact of environmental factors on biological system
- demonstrate the ability to orally and in writing, present and discuss ideas and outcomes, communicate and collaborate with persons with or without the technical and scientific background
- demonstrate skills in the economy and leadership
- demonstrate skills and ability, which represent a foundation for postgraduate studies in Biotechnology

Ability to make judgements and adopt a standpoint

To receive a Degree of Master of Science in Engineering, the students should:

- demonstrate a responsible attitude and the ability to take a stand on issues of ethical nature in the application areas of Biotechnology
- demonstrate the ability to rapidly acquire knowledge in new areas and in the field of Biotechnology to apply those for technological innovation and development
- demonstrate the ability to critically review the literature and technologies in Biotechnology and related areas

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 (see list below of the masters programme that can be selected study year 2012/2013) .

For more information, se

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

Masters programmes available for Biotechnology students 2012/2013*

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

* The list of masters programmes is subject to change. Updated lists of all masters programmes can be found in the study handbook for the respective study year.

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 some courses are given in Swedish and some in English. For each course the language of instruction is found in the Course and program directory on the KTH student web site.

Eligibility and selection

In order to be accepted to the Degree programme, in Biotechnology the basic eligibility requirements as well as the following requirements must be met:

Area of competence 9 *

Mathematics E

Physics B

Chemistry A

All with at least a grade of G.

For eligibility requirements and selection guidelines, see KTH's admission policy <http://intra.kth.se/regelverk/utbildning-forskning/grundutbildning/antagning/1.27186>

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

Implementation of the education

Structure of the education

Study year 1-3, first cycle

The programme plan for the degree programme, in Biotechnology consists of compulsory courses in biotechnology, mathematics and chemistry during study year 1-2. Study year 3 contains applied biotechnology courses and a degree project, first level, for a degree of bachelor of science.

Study year 1-2, second cycle

During study year 1 and 2 the programme continues with courses at second cycle within a Master's programme, recommended of the degree programme in Biotechnology.

The programme is designed in such a manner that the student after three years of studies can obtain a degree of bachelor of science. The student can then continue his/her studies at a Masters programme recommended for the Biotechnology programme, continue his/her studies at another programme at KTH or another university in Sweden or abroad or start his/her work career. If another masters programme than those recommended within the degree programme in Biotechnology are read, the student will not receive a degree certificate in Biotechnology.

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

http://www.kth.se/student/schema/1.1007?l=en_UK

Courses

The programme is course-based. Lists of courses are included in [appendix 1](#).

The programme consists of compulsory, conditionally elective and optional courses. The compulsory courses are defined for every study year in the teaching and time schedule. The different courses goals, prerequisites, contents and examination requirements can be found in the respective course plans.

Only under certain circumstances can optional courses be taken earlier than year three.

Optional courses can be chosen from KTH's course selection for Master of Science in Engineering programmes. Even courses from other universities/higher education institutions can be recognized for credit, if the degree requirements are fulfilled.

For optional courses, the following restrictions apply:

- Optional courses can not be taken in study year 1
- Only under certain circumstances can optional courses be taken earlier than in study year three.
- The number of credits which can be taken per term can be limited.

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

Enrolment notification and term registration

Before every term, a term enrolment must be submitted via the study advisor at the programme office for Biotechnology, BIO students office.

Your enrolment notification constitutes the foundation for the office's planning and that you are registered for the programme.

Term registration is required in order for you study results to be registered and for CSN to distribute student aid.

Course Selection

Application to courses

The student is responsible from study year 1 and on to apply to compulsory, conditionally elective and optional courses which are included in the programme which he/she is studying. 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.

Students will be informed about how an application for admission to courses shall be done by the students office.

Applications which are submitted after the deadline are only taken into consideration with regards to space considerations. Before course selection of language courses, a test must be taken to determine the appropriate level study.

Course registration

Registration of a course requires that the course has been selected in Ladok. The course selection is done either via the course selection routine on the web, or via the BIO students office. Registration of a course is done by the course's department.

The student must, at the first scheduled lecture, register him/herself in the course. Course registration in both compulsory and optional courses must be done individually (at the department). If the student registers a course and then decides to not continue with the course, then the student must notify the corresponding department 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.

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.

Choice of Masters Program

Study year 3, the student applies for a Masters programme he/she intends to follow during the last 2 study years.

For more information about the Masters programme given within the degree programme, in Biotechnology, see descriptions in appendix 2, and programme plans for the masters programme.

Admission for Masters programme

Before the fall term starts, year 2015, the student must have achieved following to start a Masters programme.

- *Requirements for promotion from grade 3 to grade 1, 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, for a degree of bachelor of science.

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 students office.

The complete KTH policy for recognition of previous academic studies is found in the KTH-handbook.

http://intra.kth.se/regelverk/utbildning-forskning/grundutbildning/prestationer/policy-for-tillgodoraknande-av-hogskoleutbildning-inklusive-bedomning-av-reell-kompetens-1.27200?l=en_UK

Overlap

Courses that in contents overlap with another or other courses in the programme cannot be counted within the framework of the 300 credits, which is the basis for the degree.

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 contact the international coordinator at BIO 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.

Admission to start a degree project, first level, at least 120 credits, of which the course BB1100 Biochemistry is one, must be completed.

It is recommended that the following courses is completed before thesis work begins:

BB1110 Gene Technology and Molecular Biology

BB1120 Cultivation Technology

BB1130 Analysis and Purification of Biomolecules

KTH comprehensive rules and guidelines for thesis 15 credits for Degree of Bachelor of Science 180 credits, and grading of the thesis is in the KTH-Study Handbook.

<http://intra.kth.se/regelverk/utbildning-forskning/grundutbildning/examensarbete/1.27211>

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.

KTH comprehensive rules and guidelines for thesis 30 credits for Degree of Master of Science in Engineering, Degree Programme in Biotechnology 300 credits, and grading of the thesis is in the KTH-Study Handbook.

http://intra.kth.se/regelverk/utbildning-forskning/grundutbildning/examensarbete/overgripande-regler-och-riktlinjer-for-examensarbete-30-hogskolepoang-for-masterexamen-120-hogskolepoang-samt-betygssattning-av-examensarbete-1.27212?l=en_UK

Degree project at advanced level for the Degree of Master of Science in Engineering, Biotechnology, can be completed in exam working topics:
Biotechnology.

Other degree project topics may be considered upon application. For more information, contact the study advisor at the BIO students office.

It is the responsibility of the student to find a suitable project task.

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.

Instructions for application for examination is made available on the KTH student web.

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 fulfills the national degree requirements and complete all courses within the program corresponding to 180 credits, of which

- mathematical-natural scientific courses of at least 25 credits,
- at least 90 credits (including 15 credits of degree project work) with the gradual deepening of the main field of education.

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 fulfills 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. At least 15 higher education credits in subjects central to Biotechnology. For more information please see the programme syllabus for the Masters programmes available for Biotechnology students; TIMBM, TMBIM, TMMMM and TMVTM.

Degree Name

Civilingenjörsexamen

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

Conditions for Degree of Master of Science (Two Years) 300 credits.

Degree of Master of Science (Two Years) is received after completing the programme. The programme is formed so that the student fulfills 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

Degree Name

Master of Science (120 credits)

Teknologie masterexamen

Reference to KTH guidelines (KTH-Handbook)

Local degree ordinance for degrees at first cycle and advanced cycle.

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 Biotechnology (CBIOT), Programme syllabus for studies starting in autumn 2012

General courses

Year 1

Mandatory courses (62.5 Credits)

Course code	Course name	Credits	Edu. level
BB1010	Introduction to Biotechnology	7.5 hp	First cycle
BB1020	Cell Biology with Immunology	6.0 hp	First cycle
KD1020	Introductory Chemistry	6.0 hp	First cycle
KD1090	Organic Chemistry 1	7.5 hp	First cycle
KD1200	Chemical Equilibria	7.0 hp	First cycle
SF1624	Algebra and Geometry	7.5 hp	First cycle
SF1625	Calculus in One Variable	7.5 hp	First cycle
SF1626	Calculus in Several Variables	7.5 hp	First cycle
SG1102	Mechanics, Smaller Course	6.0 hp	First cycle

Optional courses

Course code	Course name	Credits	Edu. level
KE1110	Introductory Course in Chemistry	1.5 hp	First cycle
SF1611	Introductory Course in Mathematics I	1.5 hp	First cycle

Supplementary information

Study year 1 consists of mandatory courses.

The course BB1020 Cellbiology with Immunology is divided over study year 1 and 2, as follows:
Cellbiology 3,5 credits will be given in period 3 during study year 1
Immunology 2,5 credits will be given in period 3 during study year 2.

Year 2

Mandatory courses (63.5 Credits)

Course code	Course name	Credits	Edu. level
BB1020	Cell Biology with Immunology	6.0 hp	First cycle
BB1030	Microbiology	9.0 hp	First cycle
BB1085	Biochemistry, Theory	6.5 hp	First cycle
KD1040	Chemical Thermodynamics	7.5 hp	First cycle
KD1060	Molecular Structure	7.5 hp	First cycle
KD1080	Chemical Dynamics	6.0 hp	First cycle
KD1100	Organic Chemistry 2	7.5 hp	First cycle
SF1633	Differential Equations I	6.0 hp	First cycle
SK1111	Electromagnetism and Waves	7.5 hp	First cycle

Supplementary information

Study year 2 consists of mandatory courses.

The course BB1020 Cellbiology with Immunology is divided over study year 1 and 2, as follows:
Cellbiology 3,5 credits will be given in study period 3 during study year 1
Immunology 2,5 credits will be given in study period 3 during study year 2.

Year 3

Mandatory courses (60.0 Credits)

Course code	Course name	Credits	Edu. level
BB101X	Degree Project in Biotechnology, First Cycle	15.0 hp	First cycle
BB1105	Biochemistry, Laboratory Course	7.0 hp	First cycle
BB1110	Gene Technology and Molecular Biology	7.0 hp	First cycle
BB1120	Cultivation Technology	6.0 hp	First cycle
BB1130	Analysis and Purification of Biomolecules	7.0 hp	First cycle
KD1190	Chemical Measuring Techniques	9.0 hp	First cycle
SF1513	Numerical Methods and Basic Programming	9.0 hp	First cycle

Supplementary information

This is a preliminary list of courses for study year 3 for those who started the program 2012. There might be changes. For a correct updated list, see the *study handbook* for the respective study year.

Study year 3 consists of mandatory courses and ends with a degree project, first level.

Year 4

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

For more detailed information about the programme, see:

- Master - Industrial and Environmental Biotechnology, see http://www.kth.se/student/kurser/program/timbm/?l=en_UK
- Master - Medical Biotechnology, see http://www.kth.se/student/kurser/program/tmbim/?l=en_UK
- Master - Macromolecular Materials, see http://www.kth.se/student/kurser/program/tmmmm/?l=en_UK
- Master - Molecular Science and Engineering, see http://www.kth.se/student/kurser/program/tmvtm/?l=en_UK

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 Biotechnolgy (IMB)

Year 4

Supplementary information

For more detailed information about the Master programme (Two Years), Industrial and Environmental Biotechnology, se link below

http://www.kth.se/student/kurser/program/timbm/?l=en_UK

Master, Medical Biotechnology (MBI)

Year 4

Supplementary information

For more detailed information about the Master programme (Two Years), Medical Biotechnology, se link below

http://www.kth.se/student/kurser/program/tmbim/?l=en_UK

Master, Macromolecular Materials (MMM)

Year 4

Supplementary information

For more detailed information about the Master programme (Two Years), Macromolecular Materials, se link below

http://www.kth.se/student/kurser/program/tmmmm/?l=en_UK

Master, Molecular Science and Engineering (MVT2)

Year 4

Supplementary information

For more detailed information about the Master programme (Two Years), Molecular Science and Engineering, se link below

http://www.kth.se/student/kurser/program/tmvtm/?l=en_UK



Appendix 2: Specialisations

Degree Programme in Biotechnology (CBIOT), Programme syllabus for studies starting in autumn 2012

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 link below

http://www.kth.se/student/kurser/program/timbm/?l=en_UK

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 link below

http://www.kth.se/student/kurser/program/tmbim/?l=en_UK

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, se link below

http://www.kth.se/student/kurser/program/tmmmm/?l=en_UK

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, se link below

http://www.kth.se/student/kurser/program/tmvtm/?l=en_UK