



# Programme syllabus

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

## Degree Programme in Biotechnology 300 credits

Civilingenjörsutbildning i bioteknik

*Valid for students admitted to the education from autumn 11 (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 higher education 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 higher education credits) is in the first cycle and can, if the student applies for it, be finished with a Degree of Bachelor of Science. The last two years are mainly in the second cycle (120 higher education credits) and leads to a Degree of Master of Science in Engineering/Degree of Master of Science (Two Years).

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](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 2011/2012\**

- *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](http://www.hsv.se)

# Implementation of the education

## Structure of the education

### *Study year 1-3*

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 4-5*

During study year 4 and 5 the programme continues with courses at advanced level 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 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.

### *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](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 higher education 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.

### **Temporary Postponement**

Temporary postponement means that the student does not participate in the programme during at least one study period. If temporary postponement is approved, the student has the right to return to the studies at a pre-determined point in time. During the temporary postponement, the student is able to complete and participate in examinations in incomplete courses.

Notification of temporary postponement is done on a form which is submitted to the students office which processes it. When the student intends to resume the studies, it is necessary for the student to submit a separate notification.

### *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 whether 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 higher education 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 higher education credits from study years 1 and 2 must be completed at least 50 higher education 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 higher education credits from study years 1-3 must be completed, and at least 110 higher education 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 4, at least 45 higher education credits from study year 4 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 students 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 2014, the student must have achieved following to start a Masters programme.

- ***Requirements for promotion from grade 3 to grade 4, Masters programme:***

A total of at least 150 higher education credits from study years 1-3 must be completed, and at least 110 higher education 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](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 higher education 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 in the fourth or fifth grade. 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 higher education credits.

Admission to start a degree project, first level, at least 120 higher education 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 higher education credits for Degree of Bachelor of Science 180 higher education 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 higher education credits.

KTH comprehensive rules and guidelines for thesis 30 higher education credits for Degree of Master of Science in Engineering, Degree Programme in Biotechnology 300 higher education 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](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 higher education 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 higher education credits, of which

- mathematical-natural scientific courses of at least 25 higher education credits,
- at least 90 higher education credits (including 15 higher education 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 higher education 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 higher education credits, of which

- mathematical-natural scientific courses of at least 45 higher education credits , and, in addition, at least 180 higher education credits (including 30 higher education credits of degree project work) in the subjects central to the technical area
- at least 90 higher education credits in the second level, whereof at least 60 higher education credits (including 30 higher education 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 higher education 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 higher education credits, of which

- at least 90 higher education credits in the second level, whereof at least 60 higher education credits (including 30 higher education 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 level and advanced level.***

[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](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)

### General courses

Year 1

#### Mandatory courses (62.5 Credits)

Code	Name	Credits	Edu. level
<a href="#">BB1010</a>	Introduction to Biotechnology	7.5 hp	First cycle
<a href="#">BB1020</a>	Cell Biology with Immunology	6.0 hp	First cycle
<a href="#">KD1020</a>	Introductory Chemistry	6.0 hp	First cycle
<a href="#">KD1090</a>	Organic Chemistry 1	7.5 hp	First cycle
<a href="#">KD1200</a>	Chemical Equilibria	7.0 hp	First cycle
<a href="#">SF1624</a>	Algebra and Geometry	7.5 hp	First cycle
<a href="#">SF1625</a>	Calculus in One Variable	7.5 hp	First cycle
<a href="#">SF1626</a>	Calculus in Several Variables	7.5 hp	First cycle
<a href="#">SG1102</a>	Mechanics, Smaller Course	6.0 hp	First cycle

## Optional courses

Code	Name	Credits	Edu. level
<a href="#">KE1110</a>	Introductory Course in Chemistry	1.5 hp	First cycle
<a href="#">SF1611</a>	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 (64.5 Credits)

Code	Name	Credits	Edu. level
<a href="#">BB1020</a>	Cell Biology with Immunology	6.0 hp	First cycle
<a href="#">BB1030</a>	Microbiology	9.0 hp	First cycle
<a href="#">BB1080</a>	Biochemistry, Theory	7.5 hp	First cycle
<a href="#">KD1040</a>	Chemical Thermodynamics	7.5 hp	First cycle
<a href="#">KD1060</a>	Molecular Structure	7.5 hp	First cycle
<a href="#">KD1080</a>	Chemical Dynamics	6.0 hp	First cycle
<a href="#">KD1100</a>	Organic Chemistry 2	7.5 hp	First cycle
<a href="#">SF1633</a>	Differential Equations I	6.0 hp	First cycle
<a href="#">SK1111</a>	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)

Code	Name	Credits	Edu. level
<a href="#">BB101X</a>	Degree Project in Biotechnology, First Cycle	15.0 hp	First cycle
<a href="#">BB1105</a>	Biochemistry, Laboratory Course	7.0 hp	First cycle
<a href="#">BB1110</a>	Gene Technology and Molecular Biology	7.0 hp	First cycle
<a href="#">BB1120</a>	Cultivation Technology	6.0 hp	First cycle
<a href="#">BB1130</a>	Analysis and Purification of Biomolecules	7.0 hp	First cycle
<a href="#">KD1190</a>	Chemical Measuring Techniques	9.0 hp	First cycle
<a href="#">SF1513</a>	Numerical Methods and Basic Programming	9.0 hp	First cycle

### Supplementary information

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](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](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](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](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 Biotechnology (IMB)

### Year 4

#### Supplementary information

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](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, see link below

[http://www.kth.se/student/kurser/program/tmbim/?l=en\\_UK](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](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](http://www.kth.se/student/kurser/program/tmvtm/?l=en_UK)



# Appendix 2: Specialisations

## Degree Programme in Biotechnology (CBIOT)

### Master, Industrial and Environmental Biotechnolgy (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 Biotechnolgy, se link below

[http://www.kth.se/student/kurser/program/timbm/?l=en\\_UK](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, se link below

[http://www.kth.se/student/kurser/program/tmbim/?l=en\\_UK](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 hp

BB2020 Molecular Enzymology 7.5 credits

BB2420 Glycobiology and Carbohydrate Technology, 7.5hp

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