



Programme syllabus

Degree Programme in Biotechnology Civilingenjörsutbildning i bioteknik *300.0 credits*

Valid for students admitted to the education from autumn 09 (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

Nominal study period is 5 years, which corresponds to 300 credits (hp). 180 hp is at the basic level and 105 hp is at advanced level. The remaining is optional courses and can both at advanced and at the basic level. The programme is given in Swedish during the first three years and in English in the higher grades 4 and 5, Master (Two years).

Masters programmes available for Biotechnology students 2010/2011*

- *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.

Eligibility and selection

In order to be admitted to the programme, basic eligibility and specific competence in Mathematics Course D, Physics course B, Chemistry course A, is required. In each subject, the passing grade G or 3 is the minimum requirement. The grade selection (BG and DB) is applied to two thirds of the seats. Seats are distributed proportionally, based on the number of qualified applicants in two groups.

Implementation of the education

Structure of the education

The school year is normally divided into 4 study periods and two or three courses are taken simultaneously at each period. Teaching and examination methods vary between courses. Normally, a proportion of the course is lectures, which gives an introduction with the concepts and theories. Exercises, seminars and laboratory work enhance the understanding of the theoretical relationship. In order to create a continuity of the program, collaboration between courses is emphasized. The programme is completed by doing a

Master's thesis equivalent to 30 credits. The programme's first two years are devoted mainly to courses in mathematics and chemistry. Applied Biotechnology courses are the dominating subjects in the third year. The courses in year three are completed by doing a project course that can be used as bachelor's thesis and consequently the completing course for the Bachelor's degree. Courses at advanced level in the focus areas are studied in year four and five. To receive a Degree of Master of Science in Engineering, the students should have passing grades in all the mandatory and optional courses, which including the thesis will comprise 300 ECTS. The student must have fulfilled the selected specialization profile. The courses included in the Biotechnology programme are listed in the course list for year 1-3 and for the specialization profiles.

Courses

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

The course list can be found 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.

A seven scaled grading system from A-F is used for courses at basic and advanced level at KTH. A-E are passing grades, where A is the highest grade. The grades pass (P) and fail (F) are used for courses under certain circumstances. The grade Fx implies an opportunity to complement a failed grade to the passing grade E.

Conditions for participation in the programme

Enrolment notification and term registration

Before every term (1-15th May and 1-15th November), a term enrolment must be submitted via to 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 the web at Studera.nu, at the latest:

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

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 grade 1 to grade 2:

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

Requirements for promotion from grade 2 to grade 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 grade 3 to grade 4:

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 grade 4 to grade 5:

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, during the fall term (1-15 november), the students applies for a Masters programme he/she intends to follow study year 4 and 5

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, 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

The student has the right to transfer course credits from the college / university within or outside the country. The precondition is that the course / courses are of such a nature and have such an extent that they basically correspond to the qualification criteria for the programme. In the case of whole courses, it must be checked by the programme director. Part of a course is checked by the examiner.

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 in the program have the opportunity to study one academic year or one semester abroad at a foreign institution, which KTH is cooperating with. The students don't need to pay the fees which would otherwise be charged by foreign students. Exchange studies can be done in the third, fourth and fifth year of the programme. It is also possible to do the Master's thesis abroad. Information about studying abroad is given by the international coordinators at the student office of BIO, which also provide information on current application period. The students can find the application forms at the student Office. After evaluation, the exchange studies can count as part of the programme. The outgoing student must set up a "Learning Agreement" with the programme director, which implies the prior approval of the exchange studies. The studies are normally given in the language spoken in the selected country / region. There are opportunities, for those who are accepted to the exchange programme in German-, French-, Spanish- and Italian-speaking countries, to follow a preparatory language course before the regular semester begins.

Degree project

The program includes a Master's thesis of 30 credits. That means about 20 weeks of full-time studies. The thesis must be done in the chosen focus area of the programme. The thesis project should provide the students an insight into a research and development projects. It may also be of investigative nature. The thesis is graded according to the scale A-F, based on the KTH-common assessment and criteria. In the thesis project, students demonstrate the ability to independently apply the knowledge they have acquired during the studies. The student may start with the thesis when 230 credits are achieved. Exemption can be granted after a checkup by the programme director. It is the responsibility of the examiner to ensure that students have the in-depth studies in the focus area, as regarded above. The project may be carried out

either in an academic environment or in an industrial setting. It can also be carried out abroad. Examiner for the thesis is appointed by the programme director and should always be a teacher, who is employed at the Biotechnology Institute. The programme director may grant dispensation for doing the thesis supervised by other teachers at KTH as an examiner, in an area related to Biotechnology, after agreement with the institution and the examiner. Supervisors are appointed by the examiner. Several supervisors can be appointed. If the thesis is performed in a company, a supervisor should also be appointed at the company.

Before the thesis is started, it must be approved by the examiner and recorded by the School of Biotechnology, when an application, "Degree projects and Project courses", is handed in to the Student Office of Biotechnology in AlbaNova. The thesis project will consist of literature search, experimental and / or theoretical work. It will be presented both in a written statement in English, and orally at a seminar. It is the responsibility of the examiner to ensure that the thesis is performed and presented as above.

Degree

To receive a Degree of Master of Science in Engineering passing grades in all courses included in the student's study plan, are required. The study plan consists of the mandatory courses, the recommended and / or conditionally elective courses that the students have followed and the thesis. The study plan should include at least 300 credits. For receiving a degree certificate, the student need to apply for it on an application form and provide a copy of a student union card, copy of receipts or a certificate from the student union for paid union fee.

[Appendix 1 - Course list](#)

[Appendix 2 - Programme syllabus descriptions](#)



Appendix 1: Course list

Programme syllabus for studies starting in autumn 2009, Degree Programme in Biotechnology (CBIOT)

General courses

Year 1

Mandatory courses (62.5 Credits)

Code	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
KD1150	Chemical Equilibria	7.5 hp	First cycle
SF1643	Numbers and Functions	4.0 hp	First cycle
SF1644	Calculus in one Variable	8.0 hp	First cycle
SF1645	Linear Algebra	4.0 hp	First cycle
SF1646	Calculus in Several Variable	6.0 hp	First cycle
SG1102	Mechanics, Smaller Course	6.0 hp	First cycle

Supplementary information

Study year 1 consists of mandatory courses.

Year 2

Mandatory courses (58.5 Credits)

Code	Name	Credits	Edu. level
BB1030	Microbiology	9.0 hp	First cycle
BB1080	Biochemistry, Theory	7.5 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.

Year 3

Mandatory courses (59.0 Credits)

Code	Name	Credits	Edu. level
BB101X	Degree Project in Biotechnology, First Cycle	15.0 hp	First cycle
BB1100	Biochemistry, Laboratory Course	6.0 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
DN1212	Numerical Methods and Basic Programming	9.0 hp	First cycle
KD1190	Chemical Measuring Techniques	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
- 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 Biotechnology (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, see link below

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



Appendix 2: Specialisations

Programme syllabus for studies starting in autumn 2009, 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 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)

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)

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