



Programme-specific Section of the Curriculum for the MSc Programme in Biotechnology with a minor subject at the Faculty of Science, University of Copenhagen 2020 (rev. 2024)

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1 Title, affiliation and language

A shared section that applies to all BSc, part-time MSc and MSc Programmes at the Faculty of Science is linked to this programme-specific curriculum.

1.1 Title

The MSc Programme in Biotechnology with a minor subject leads to a Master of Science (MSc) in Biotechnology and minor in [the minor subject] with the Danish title: *Cand.scient. (candidatus/candidata scientiarum) i bioteknologi med sidefag i [the minor subject]*.

It will appear from the diploma that the study programme has been completed as a MSc in two subjects and, provided that the requirements pertaining to the Upper Secondary School course packages (*gymnasiefagpakkerne*) have been met, that academic qualifications (*faglig kompetence*) for teaching at the Danish Upper Secondary School in the subjects have been achieved.

1.2 Affiliation

The programme is affiliated with the Study Board for the Biological Area and the students can both elect, and be elected, to this study board.

1.3 Corps of external examiners

The following corps of external examiners is used for the central parts of the MSc Programme:

- Corps of External Examiners for Agricultural Science (*jordbrugsvidenskab*).

1.4 Language

The language of this MSc Programme is English.

2 Academic profile

2.1 Purpose

The objective of the program is to offer students a coherent profession-oriented education within the field of biotechnology. On completion of the programme, students will be able to perform research at all levels and analyse and solve questions and problems within the broad field of biotechnology.

The MSc programme is primarily within the field of natural sciences, supplied with aspects of innovation and business. The biotechnology programme is an international degree and will be conducted in English.

2.2 General programme profile

The aim of the programme is to give students:

- Both theoretical knowledge and method-oriented practical skills in applied biotechnology and biochemistry within the fields of micro-organisms, plants and animals. Insight on how to apply these organisms as model and production systems.
- The knowledge required to analyse complex biotechnology problems of importance for the biotechnological industry, governmental agencies, or educational programmes.
- The ability to communicate knowledge at all levels, and a general understanding of the interactions between biotechnology, industry, society, and the environment.

Biotechnology is the key subject area of the programme.

2.3 General structure of the programme

The MSc Programme is set at 120 ECTS when the minor subject is within the field of sciences.

Exercise and Sport Sciences is in this regard considered as being outside the field of science.

The MSc Programme in Biotechnology with a minor subject consists of the following elements:

- Specialisation, 120 ECTS including the thesis.

The student must choose one of the following specialisations:

- General Profile in Biotechnology with a minor subject in Biology
- General Profile in Biotechnology with a minor subject in Chemistry

2.4 Career opportunities

The MSc Programme in Biotechnology with a minor subject qualifies students to become professionals within business functions and/or areas such as:

- Upper secondary school teacher in Biotechnology and the minor subject.
- Researcher/quality manager in biotechnological industry
- Scientist at research institutions
- Advisor and consultant in governmental agencies
- Product specialist in biotech sales organisations
- A PhD programme
- Educational establishments

3 Description of competence profiles

Students following the MSc Programme acquire the knowledge, skills and competences listed below. Students will also acquire other qualifications through elective subject elements and other study activities.

3.1 Competence profile

Graduates holding an MSc in Biotechnology with a minor subject have acquired the following:

Knowledge about:

- Didactic literature, concepts and methods.
- The biological complexities with the field of cell and organism biology and molecular biology at an advanced level including the principles of cell functions and genetic control of these processes.
- Critical reflection on the theory behind biotechnological methods.
- Model systems to obtain and integrate fundamental knowledge about organisms and to understand complex biological processes.
- The usefulness of different organisms as expression hosts in research and as production units.
- Digital tools to be able to analyse complex data sets.
- Integrated approaches to address biotechnological questions using genetics, physiology, biochemistry and bioinformatics in order to relate phenotypes to genotype and as platforms for modelling organism metabolism at the molecular level.

Skills in/to:

- Using methods and analysing data in analytical chemistry
- Apply didactic terminology correct, and use it to be able to argue with these terms for the content and progression of the student activities in relation to teaching.

- Use basic knowledge from other disciplines in an integrated manner when analysing and solving current problems in biotechnology.
- Discuss and choose techniques in molecular biology, design of laboratory protocols and safety procedures in relation to handling and use of organisms in biotechnology.
- Transfer techniques and principles to new hypotheses based on biotechnological/biochemical, and/or mathematical/statistical descriptions, which can be statistically and experimentally tested.
- Use digitalisation such as scripting to handle and analyse large and complex data sets within biotechnology.
- Use advanced methods and solutions in molecular biology in the context of a project.
- Set up preparations for a research plan, including critical discussion of literature and identification of problems, develop hypotheses and concrete research questions, determine data requirements and select appropriate methods.
- Read, discuss and present original scientific articles within the field.
- Read and interpret patents within bioscience
- Communicate effectively to specialist and non-specialist audience at a variety of levels, using modern and appropriate information and communication tools.

Competences in/to:

- Analyse the justifications and description of goals in the official guidelines for teaching.
- Analyse and evaluate concrete teaching situations in relation to their learning potential.
- Transfer theories and principles from advanced state-of-the-art molecular biology to solve new questions posed by the research community, the industry and the society.
- Find innovative solutions based on sustainability perspectives and climate neutral development.
- Independently apply the right digital tools for different analytical purposes and how to complete the process in experimental design
- Work effectively in teams as well as independently, apply project management in cross-disciplinary environments.
- Use lifelong learning as a principle to independently evaluate and structure learning processes and assume responsibility for continuous professional development.

4 Admission requirements

The admission requirements for the MSc Programme in Biotechnology with a minor subject is the same as the admission requirements listed in paragraph 4 in “Programme-specific Section of the Curriculum for the MSc Programme in Biotechnology” supplemented with the following:

- At least 105 ECTS from the Upper Secondary School course package (*gymnasiefagpakken*) are included in the BSc programme.
- At least 45 ECTS from the minor subject is included in the BSc programme.
 - If the minor subject is Biology, 45 ECTS must be contained in the minor subject Upper Secondary School course package (*den reducerede gymnasiefagpakke*) in Biology.
 - If the minor subject is Chemistry, 45 ECTS must be contained in the minor subject Upper Secondary School course package (*den reducerede gymnasiefagpakke*) in Chemistry.

5 Prioritisation of applicants

With a Bachelor's degree in Biotechnology from University of Copenhagen the student is granted reserved access and guaranteed a place on the MSc Programme in Biotechnology with a minor subject if the student applies in time to begin the MSc Programme within three years of the completion of the Bachelor's degree.

If the number of qualified applicants to the programme exceeds the number of places available the applicants will be prioritised according to paragraph 5 in "Programme-specific Section of the Curriculum for the MSc Programme in Biotechnology".

6 Structure of the programme

The compulsory subject elements, restricted elective subject elements and the thesis constitute the central parts of the programme (Section 30 of the Ministerial Order on Bachelor and Master's Programmes (Candidatus) at Universities).

Before the beginning of the MSc Programme the student must choose a specialisation.

6.1 General Profile in Biotechnology with a minor subject in Biology

The programme is set at 120 ECTS and consists of the following:

- Compulsory subject elements (major subject), 7.5 ECTS
- Compulsory subject elements (minor subject), 22.5 ECTS
- Restricted elective subject elements (major subject), 30 ECTS.
- Elective subject elements, 30 ECTS
- Thesis, 30 ECTS.

6.1.1 Compulsory subject elements within the major subject

All of the following subject elements are to be covered (7.5 ECTS):			
Course Code	Course Title	Block	ECTS
NPLK19000U	Big Data in Biotechnology	Block 1	7.5 ECTS

6.1.2 Compulsory subject elements within the minor subject

All of the following subject elements are to be covered (22.5 ECTS):			
Course Code	Course Title	Block	ECTS
NBIA04026U	Populationsbiologi	Block 2	7.5 ECTS
NBIA04035U	Menneskets fysiologi	Block 2	7.5 ECTS
NBIA08033U	Feltbiologi I, II og III	Block 4	7.5 ECTS

6.1.3 Restricted elective subject elements within the major subject

30 ECTS are to be covered as subject elements from the following lists:			
Course Code	Course Title	Block	ECTS
LBIK10135U	Genome and Cell Biology	Block 1	7.5 ECTS
NPLK17001U	Advanced Microbial Biotechnology	Block 1	7.5 ECTS
LBIK10180U	Applied Microbiology	Block 2	7.5 ECTS
LBIK10136U	Heterologous Expression	Block 3	15 ECTS
LBIK10207U	Synthetic Biology	Block 3	7.5 ECTS
NPLB14027U	Analytical Chemistry	Block 3	7.5 ECTS
LBIK10214U	Frontiers in Plant Science	Block 4	7.5 ECTS

6.1.4 Elective subject elements

The elective subjects are generally covered by the subject elements which the student follows on the minor subject.

- It is, however, possible to release elective subject elements if the academic minimum requirements for the minor subjects have been met – this will, e.g., be the case if one or both of the following two conditions are present:
 - A subject element forms part of both the major and minor Upper Secondary School course packages (*gymnasiefagpakker*). The subject elements should only be passed once, and the student has full freedom of choice in terms of the remaining ECTS.
 - If less than 45 ECTS within the minor subject are missing when entering the MSc Programme.
- In this specialisation, 30 ECTS are to be covered as elective subject elements due to overlap in academic content between major and minor subject.
- BSc subject elements corresponding to 7.5 ECTS may be included in the MSc Programme as elective subject elements without the approval of the study board.
- Projects. See 6.1.5 Projects.

6.1.5 Projects

- Projects outside the course scope may be included in the elective section of the programme by up to 15 ECTS. The main supervisor must be employed at either SCIENCE or SUND. The regulations are described in Appendix 5 to the shared section of the curriculum.
- Projects in practice may be included in the elective section of the programme by up to 15 ECTS. The main supervisor must be employed at SCIENCE. The regulations are described in Appendix 5 to the shared section of the curriculum.
- Thesis preparation projects may not be included in the elective section of the programme.

6.1.6 Thesis

The MSc Programme in Biotechnology includes a thesis corresponding to 30 ECTS, as described in Appendix 2 to the shared curriculum. The thesis must be written within the academic scope of the programme.

The main supervisor must be employed at either SCIENCE or SUND.

6.1.7 Academic Mobility

The academic mobility is generally covered by the subject elements which the student follows on the minor subject.

The student has the possibility to arrange academic mobility during the programme according to the rules and regulations regarding pre-approvals and credit.

6.2 General Profile in Biotechnology with a minor subject in Chemistry

The programme is set at 120 ECTS and consists of the following:

- Compulsory subject elements (major subject), 7.5 ECTS
- Compulsory subject elements (minor subject), 60 ECTS
- Restricted elective subject elements, 22.5 ECTS.
- Thesis, 30 ECTS.

6.2.1 Compulsory subject elements within the major subject

All of the following subject elements are to be covered (7.5 ECTS):			
Course Code	Course Title	Block	ECTS
NPLK19000U	Big Data in Biotechnology	Block 1	7.5 ECTS

6.2.2 Compulsory subject elements within the minor subject

All of the following subject elements are to be covered (60 ECTS):			
Course Code	Course Title	Block	ECTS
NKEA05040U	Videregående organisk kemi (KemiVO)	Block 1	7.5 ECTS
NKEB23002U	Materials Chemistry (MatKem)	Block 2	7.5 ECTS
NKEB10003U	Uorganisk kemisk syntese (UorgSyn)	Block 3	7.5 ECTS
NKEA04034U	Kemisk binding (KemiBin)	Block 4	7.5 ECTS
NKEB13006U	Anvendt spektroskopi (AnvSpek)	Block 4	7.5 ECTS
NKEB19001U	Termodynamik og kinetik (TermoKin)	Block 1	7.5 ECTS
NKEA60002U	Kemiske undervisningsforsøg (KUF)	Block 1	7.5 ECTS
NKEB14006U	Eksperimentel fysisk kemi (FysKem2)	Block 2	7.5 ECTS

6.2.3 Restricted elective subject elements within the major subject

22.5 ECTS are to be covered as subject elements from the following lists:			
Course Code	Course Title	Block	ECTS
LBIK10135U	Genome and Cell Biology	Block 1	7.5 ECTS
NPLK17001U	Advanced Microbial Biotechnology	Block 1	7.5 ECTS
LBIK10180U	Applied Microbiology	Block 2	7.5 ECTS
LBIK10207U	Synthetic Biology	Block 3	7.5 ECTS
NPLB14027U	Analytical Chemistry	Block 3	7.5 ECTS

6.2.4 Elective subject elements

The elective subjects are generally covered by the subject elements which the student follows on the minor subject.

It is, however, possible to release elective subject elements if the academic minimum requirements for the minor subjects have been met – this will, e.g., be the case if one or both of the following two conditions are present:

- A subject element forms part of both the major and minor Upper Secondary School course packages (*gymnasiefagpakker*). The subject elements should only be passed once, and the student has full freedom of choice in terms of the remaining ECTS.
- If less than 45 ECTS within the minor subject are missing when entering the MSc Programme.

This specialisation does not include elective subject elements.

6.2.5 Thesis

The MSc Programme in Biotechnology includes a thesis corresponding to 30 ECTS, as described in Appendix 2 to the shared curriculum. The thesis must be written within the academic scope of the programme.

The main supervisor must be employed at either SCIENCE or SUND.

6.2.6 Academic Mobility

The academic mobility is generally covered by the subject elements which the student follows on the minor subject.

The student has the possibility to arrange academic mobility during the programme according to the rules and regulations regarding pre-approvals and credit.

7 Exemptions

In exceptional circumstances, the study board may grant exemptions from the rules in the curriculum specified solely by the Faculty of Science.

8 Commencement etc.

8.1 Validity

This subject specific section of the curriculum applies to all students enrolled in the programme – see however Appendix 2.

8.2 Transfer

Students enrolled on previous curricula may be transferred to the new one as per the applicable transfer regulations or according to an individual credit transfer by the study board.

8.3 Amendment

The curriculum may be amended once a year so that any changes come into effect at the beginning of the academic year. Amendments must be proposed by the study board and approved by the Dean.

Notification about amendments that tighten the admission requirements for the programme will be published online at www.science.ku.dk one year before they come into effect.

If amendments are made to this curriculum, an interim arrangement may be added if necessary to allow students to complete their MSc Programme according to the amended curriculum.

Appendix 1 The recommended academic progression

The table illustrates the recommended academic progression. The student is allowed to plan an alternative progression within the applicable rules.

Table for students admitted to the programme in September (summer):

Table – MSc Programme in Biotechnology with a minor subject in Biology

	Block 1	Block 2	Block 3	Block 4
1st year	Big Data in Biotechnology	Populationsbiologi	Elective	Feltbiologi I, II og III
	Elective	Menneskets fysiologi	Restricted elective	Restricted elective
2nd year	Elective	Elective	Thesis	
	Restricted elective	Restricted elective		

Table – MSc Programme in Biotechnology with a minor subject in Chemistry

	Block 1	Block 2	Block 3	Block 4
1st year	Big Data in Biotechnology	Materials Chemistry	Uorganisk kemisk syntese	Kemisk binding
	Videregående organisk kemi	Restricted elective	Restricted elective	Anvendt spektroskopi
2nd year	Termodynamik og kinetik	Eksperimentel fysisk kemi	Thesis	
	Kemiske undervisningsforsøg	Restricted elective		

Table for students admitted to the programme in February (winter):

Table – MSc Programme in Biotechnology with a minor subject in Biology*

	Block 3	Block 4	Block 1	Block 2
1st year	Elective	Restricted elective	Big Data in Biotechnology	Populationsbiologi
	Elective	Elective	Restricted elective	Menneskets fysiologi
2nd year	Elective	Feltbiologi I, II og III	Thesis	
	Restricted elective	Restricted elective		

*This table is only relevant for students who begin the MSc Programme in February (block 3).

Table – MSc Programme in Biotechnology with a minor subject in Chemistry*

	Block 3	Block 4	Block 1	Block 2
1st year	Uorganisk kemisk syntese	Kemisk binding	Termodynamik og kinetik	Materials Chemistry
	Restricted elective	Anvendt spektroskopi	Videregående organisk kemi	Eksperimentel fysisk kemi
2nd year	Thesis		Big Data in Biotechnology	Restricted elective
			Kemiske undervisningsforsøg	Restricted elective

*This table is only relevant for students who begin the MSc Programme in February (block 3).

Appendix 2 Interim arrangements

The Shared Section that applies to all BSc, part-time MSc and MSc Programmes at the Faculty of Science applies to all students.

1 General changes for students admitted in the academic year 2022/23

Students admitted to the MSc Programme in the academic year 2022/23 must finish the programme as listed in the curriculum above with the following exceptions.

1.1 General Profile in Biotechnology with a minor subject in Chemistry

Restricted elective subject elements within the major subject

22.5 ECTS are to be covered as subject elements from the following lists:			
Restricted elective subject elements offered as part of this curriculum (see above)			
LBIK10136U	Heterologous Expression	Block 3	15 ECTS
LBIK10214U	Frontiers in Plant Science	Block 4	7.5 ECTS

2 Discontinued courses

Course Code	Course Title	ECTS	Interim arrangement
NKEB13015U	Materials Chemistry (MatKem)	7.5	The course was compulsory on the specialisation with a minor subject in Chemistry in the academic year 2022/23. Offered for the last time: 2022/23 The course is replaced by Materials Chemistry (NKEB23002U), 7.5 ECTS

Appendix 3 Description of objectives for the thesis

After completing the thesis, the student should have:

Knowledge about:

- How to identify scientific problems within the biotechnological area.
- How to summarize a suitable combination of methodologies and theories based on international research for use in the problem formulation.
- How to discuss theories and models on the basis of sustainable biotechnological solutions with a high degree of independence.

Skills in/to:

- Apply and critically evaluate theories and methodologies within the field including applicability and limitations.
- Make conclusions in a clear and academic manner in relation to the problem formulation and the outcome of the experiments.
- Process data through a choice of academic analysis methods and present findings objectively and in a concise manner.

Competences in/to:

- Initiate and perform academic work and find solutions in a biotechnological research context.
- Solve complex problems and designing experiments in a professional context.
- Presenting and disseminating scientific results.