



Curriculum of the Master Degree Programme

“Biotechnology”

Code: 066 418

**University of Natural Resources
and Life Sciences, Vienna**

Center for International Relations

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Impressum

Center for International Relations
University of Natural Resources and Life Sciences, Vienna
Peter Jordan Strasse 82a, 1190 Vienna
Austria, Europe
Phone:(+43-1)-47654-2600
Fax:(+43-1)-47654-2606
e-mail: zib(at)boku.ac.at
<http://www.zib.boku.ac.at/>

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<p style="text-align: center;">Curriculum of the Master degree programme “Biotechnology” At the University of Natural Resources and Life Sciences, Vienna</p>

As at October 1st, 2010

§ 1 Description of Qualification

Biotechnology is the integration of biological sciences, chemistry and processing technology, which aims to use organisms, cells and macro-molecules to manufacture process and prepare bio-genetic raw materials in order to produce by-products for the good of the general public and the environment.

The academic education provided within the Masters degree in Biotechnology must take into account the high interdisciplinary aspects of the combination of foundation courses, such as biochemistry, microbiology, genetics and mathematics, with applied engineering sciences such as biological processing technology. In addition to the teaching of a scientific/technical subject to a high level, equivalent importance is also given to personality development. As part of personality development, guidance in independent, critical and logical thinking, the ability to work abstractly, the ability to communicate and work within a team, as well as acting ethically responsibly are promoted.

The aim of the Masters degree in Biotechnology is to provide an advanced scientific education based on the alliance of biology, chemistry and technology and their technological applications. The focal points are found in the areas of cell and molecular biology, biochemistry, nano-biotechnology, bio-technological material production and transformation, biological processing technology, quality management und legal norms.

The employment opportunities are diverse, from occupations in scientific research and development, in the planning, control and monitoring of biotechnological processes and applications, to the production of biological substances. Opportunities for specialisation exist in the following fields of employment: bio-processing, agricultural biotechnology, environmental biotechnology, pharmaceutical biotechnology, quality management, nano-biotechnology, molecular biotechnology, cell and tissue engineering, bio-safety, regulatory affairs, and food biotechnology.

In addition, the curriculum also allows students to become competent in the areas of economics and management. International relations are promoted through numerous exchange programmes, international co-operation and foreign language modules.

An industrial work placement of two months duration supports the vocational education.

§ 2 Format of the Master Degree Programme

The Masters degree in Biotechnology comprises four semesters and is made up of 63 credits (also known as “semester hours”, *Semesterstunden*, SST), or 120 ECTS; of which 44 SST are compulsory modules, 6 SST are optional modules and 13 SST are modules chosen from an approved list provided by the university.

§ 3 Admission to the Master Degree

Graduates of the Bachelor degree in Food Science and Biotechnology of the University of Agricultural Sciences, Vienna, will be admitted to the Masters degree programme.

In addition, according to §35(4), graduates of acceptable Bachelor degrees or an equivalent degree programme will be admitted to the Masters degree programme.

It should, however, be pointed out that graduates of other Bachelor degrees who wish to take the Masters degree in Biotechnology must be able to demonstrate a fundamental, equivalent knowledge of the central subjects taught within the Bachelor degree in Food Science and Biotechnology. This concerns the following individual subjects: chemistry, biology, biochemistry, microbiology, genetics, process technology, mathematics, statistics, physics, management, and law; as well as modules in general food science and general biotechnology.

§ 4 Academic Qualification

In accordance with the classification of engineering degrees, graduates of the Masters degree will be awarded the academic qualification "Graduate Engineer" ("Diplom-Ingenieur(in)"), shortened to "Dipl.-Ing." or "DI".

§ 5 Types of Courses

Courses within the meaning of this degree are:

Lectures (VO):

Courses in which portions of an academic discipline and the methods involved are didactically presented;

Lectures with exercises (VU):

Courses in which opportunities are provided for carrying out independent, practical work in addition to the didactic presentation of portions of an academic discipline;

Lectures and seminars (VS):

Lectures which are given in part within the framework of a seminar;

Practical exercises (UE):

Courses associated with specific lectures, which serve to develop the ability to carry out specific practical techniques. Such exercises may also take place away from the usual place of instruction;

Practical Training (PR):

Courses dedicated primarily to professional scientific education;

Seminars (SE):

Courses dedicated to scientific tasks and discussion, whereby a verbal presentation and/or written work is required, normally in a representative language of the scientific literature.

§ 6 Timetable of Courses¹

Used abbreviations:

SST = weekly semester hours

ECTS = European Credit Transfer System points

WS = Winter Semester

SS = Summer Semester

T2 = 2-year rotation 2 = Courses which take place on even academic years (every two years), for example 2008/09 and 2010/11.

T1 = 2-year rotation 1 = Courses which take place on uneven academic years (every two years), for example 2009 and 2011.

(1) Compulsory Courses

<i>Number</i>	<i>Type</i>	<i>Name</i>	<i>Semester</i>	<i>SST</i>	<i>ECTS</i>
Compulsory Courses					
7772.300	VU	Biophysical Chemistry	SS	2.0	3.0
791.300	VU	Bioprocess Engineering	WS and SS	3.0	9.0
954.320	VO	Cell and Molecular Biology	WS	6.0	9.0
954.300	UE	Laboratory Course in Molecular Biology II	WS or SS	3.0	4.5
772.301	UE	Practical Course in Biochemistry II	WS or SS	5.0	7.5
791.302	VO	Cell Factories	WS	6.0	9.0
801.300	VO	Nanobiotechnology	WS	2.0	3.0
851.305	VU	Computational Mathematics and Bioinformatics	SS	3.0	4.5
893.300	VU	Mechanical and Thermal Process Technology II	WS	3.0	4.5
791.303	VU	Engineering of Biotechnological Production Facilities	WS	3.0	4.5
791.342	VU	Quality Management in Biotechnology	WS or SS	3.0	4.5
731.302	VO	Patent Law	SS	2.0	3.0

(2) Elective Courses

<i>Number</i>	<i>Type</i>	<i>Name</i>	<i>Semester</i>	<i>SST</i>	<i>ECTS</i>
Biotechnology					
753.112	VO	Enzyme Technology	WS	2.0	3.0

¹ A more detailed description of all courses, including objective of the course, course contents, name of lecturer, prerequisites, recommended reading, teaching methods, assessment methods and language of instruction, is found in the BOKUonline: <https://online.boku.ac.at/>

791.304	VS	Strain Improvement of Microorganisms and Higher Eucaryotic Cells	SS	2.0	3.0
791.109	VU	Biosafety	WS	2.0	3.0
791.305	VO	Antigens and Vaccines	WS	2.0	3.0
791.307	VO	Microbial Fundamentals in Environmental Biotechnology	SS	2.0	3.0
791.110	VO	Bioprocess Technology	WS	2.0	3.0
791.308	VO	Protein Technology and Downstream Processing	WS	2.0	3.0
791.111	VO	Plant Biotechnology	WS	2.0	3.0
791.112	UE	Plant Biotechnology Practical Course	SS	3.0	4.5
791.309	VU	Animal Cell Culture Technology	WS	3.0	4.5
801.301	VO	Digital Image Processing in Food- and Biotechnology	T2, WS	2.0	3.0
773.116	VO	Renewable Materials and Green Chemistry	WS	2.0	3.0
791.311	VO	Immunology	SS	2.0	3.0
791.127	VU	Immuno Chemistry	SS	3.0	4.5
772.321	VU	Biochemical and Biotechnological Methods	WS	3.0	4.5
753.311	VO	Biochemical Reaction Engineering	WS	2.0	3.0
753.312	VU	From Sequence to Structure: Prediction, Modeling and Molecular Dynamics of Protein Structures	SS	2.0	3.0

Biochemistry

772.302	VO	Proteinchemistry	WS	2.0	3.0
773.310	VO	Bioorganic Chemistry	T2, SS	2.0	3.0
753.318	VO	Protein Structure and Function	WS	2.0	3.0
772.306	VU	Proteomics	SS	2.0	3.0
772.309	VO	Biochemistry of Trace Elements	WS	2.0	3.0
772.307	VO	Glycobiology	WS	2.0	3.0
893.304	VU	Modeling and Simulation of Biomolecules	SS	3.0	4.5
772.311	VU	Kinetics of Biochemical Reactions	SS	2.0	3.0
772.312	VO	Plant Biochemistry	WS	2.0	3.0
773.313	VU	Modern Methods in Structural Analyses	SS	3.0	4.5
771.314	VU	Instrumental Analytical Chemistry for Master Students	SS	3.0	4.5
791.326	SE	Biotechnology of Antibiotics	T2, SS	2.0	3.0
772.310	VO	Biomolecular Spectroscopy	SS	3.0	4.5
773.311		Introduction into Crystallography and NMR Spectroscopy of Proteins	SS	2.0	3.0

Cell- and Molecular Biology

801.103	VO	Methods in Ultrastructure Research	WS	2.0	3.0
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801.104	UE	Methods in Ultrastructure Research	SS	3.0	4.5
791.313	VO	Microbial Plant Protection	SS	2.0	3.0
791.314	VO	Systematics of Microorganisms	WS	2.0	3.0
791.117	VO	Methods in Molecular Biology	WS	2.0	3.0
954.301	VO	Genome Structure and Genome Analysis	WS	2.0	3.0
954.311	VO	Cell Biology	SS	2.0	3.0
954.302	VO	Molecular Genetics of Yeasts and Fungi	WS	3.0	4.5
954.303	UE	Laboratory Course in Molecular Genetics of Yeasts and Fungi	WS	3.0	4.5
791.315	UE	Special Mycology Practical Course	T2, SS	3.0	4.5
954.321	VO	Plant Molecular Biology	SS	2.0	3.0
954.305	VO	Molecular Biology of Plant-Pathogen Interactions	SS	2.0	3.0
954.306	VO	Methods in Cell Biology	SS	2.0	3.0
954.307	VO	Developmental Genetics	T2, SS	2.0	3.0
954.308	VU	Cellfactory-Plants	SS	3.0	4.5
954.309	VU	Molecular Phytopathology	SS	3.0	4.5
793.306	VU	Bioinformatics	WS or SS	3.0	4.5
954.310	VU	Phylogenetic Evaluation of DNA Sequences	WS	2.0	3.0
791.332	VO	Systems Biology	SS	2.0	3.0
801.304	VO	Prokaryotic Glycoconjugates	SS	2.0	3.0
954.316	VU	Computer-Assisted Data Analysis in Molecular Biology	WS or SS	2.0	3.0
791.333	VS	Biology of Aging	SS	2.0	3.0
954.103	VU	Molecular Biological Methods in Food Analysis	WS or SS	2.0	3.0
791.325	VO	Flow Cytometry and Cell Sorting in Biotechnology	T1, SS	2.0	3.0
772.308	VU	Genetic Model Organisms in Biotechnology	WS	3.0	4.5
793.307	VU	Machine Learning and Pattern Recognition for Bioinformatics	WS	3.0	4.5

Process Engineering and Environmental Technology

791.123	VO	Environmental Biotechnology	WS	3.0	4.5
771.117	VO	Environmental Analysis	SS	2.0	3.0
771.315	UE	Practical Course on Instrumental Analysis	SS	4.0	6.0
893.113	VU	Molecular Basics of Chemical Engineering	WS	3.0	4.5
893.305	VU	Molecular Thermodynamics	WS	2.0	3.0
893.110	VO	Energy Economics	SS	3.0	4.5
893.320	VO	Thermal Separation Processes	SS	2.0	3.0
893.321	UE	Thermal Separation Processes	SS	3.0	4.5
893.307	VO	Mechanical Separation Processes	SS	2.0	3.0
753.309	VO	Membrane Separation Processes	WS	2.0	3.0
811.103	VO	Industrial Water Management	SS	2.0	3.0

893.308	VU	Metrology II	WS	2.0	3.0
893.301	VU	Process Simulation	SS	2.0	3.0
791.124	VU	Automation of Bioprocesses	SS	2.0	3.0
893.114	VU	Electrotechnics	WS	3.0	4.5
893.112	VO	Energy and Environment Engineering	SS	3.0	4.5
813.104	VO	Waste Management	WS	2.0	3.0
35.105	VU	Mathematics for Engineers	SS	2.0	3.0

Management and Law

733.321	VU	Organisational Behaviour and Gender Issues	WS	2.0	3.0
731.311	VU	Projectmanagement - Advanced	T2, WS	2.0	3.0
734.325	VO	Introduction to Management Science	WS	2.0	3.0
735.106	SE	Rhetoric, Presentation- and Negotiationtechniques	SS	2.0	3.0
735.107	VU	Marketing	SS	3.0	4.5
791.126	VO	Innovation Management	SS	2.0	3.0
756.320	VU	Reference Materials and Methods Validation in Food Safety Assurance	SS	2.0	3.0
731.303	VO	Austrian Constitutional and Executive Law	WS	2.0	3.0
731.304	VO	Environmental Legislation	WS	2.0	3.0
731.305	VO	Principles of Law	T2, WS	2.0	3.0

Seminars

772.316	SE	Biochemical Seminar	WS	2.0	3.0
791.319	SE	Biotechnological Seminar	WS	2.0	3.0
753.315	SE	Seminar of Enzyme Technology	SS	2.0	3.0
753.319	SE	Seminar in Food Biotechnology	WS	2.0	3.0
954.312	SE	Molecular Genetics Seminar	WS	2.0	3.0
954.313	SE	Biotechnology meets Population Genetics	SS	2.0	3.0
893.309	SE	Seminar on Energy and Process Engineering	SS	2.0	3.0
791.320	SE	Environmental Biotechnology Seminar	SS	2.0	3.0
954.317	SE	Seminar in Cell Biology	WS	2.0	3.0

Practical Courses

772.317	PR	Advanced Practical Course in Biochemistry	WS or SS	3.0	4.5
791.321	PR	Biotechnology Practical	WS	3.0	4.5
893.306	PR	Energy Engineering Practical Course	WS	3.0	4.5
753.310	PR	Laboratory Course in Enzyme Technology	WS or SS	3.0	4.5

893.302	PR	Metrology Practical Course	SS	3.0	4.5
954.314	PR	Exercises in Molecular Biology	WS	3.0	4.5
791.322	PR	Regulation of Cell Metabolism Practical	WS	3.0	4.5
791.324	PR	Environmental Biotechnology Practical	SS	3.0	4.5
893.310	PR	Environmental Practical Course	SS	3.0	4.5
954.315	PR	Practical Course in Cell Biology	WS or SS	3.0	4.5

§ 7 Thesis for the Master Degree

The thesis represents an integral part of the Master Degree Programme and is worth 30 ECTS points.

The topic of the thesis is to be drawn from one of the disciplines included in the field of the Master Degree Programme.

The university instructor who has proposed the topic adopted for the thesis is to be responsible for providing the necessary guidance to the diploma candidate concerned.

The thesis is to be submitted to the Dean of Education.

§ 8 Required Practical Experience

Proof of having gained two months of relevant practical experience is required to absolve the Master Degree Programme in Biotechnology. This practical experience is to be obtained in relevant industrial enterprises and must be confirmed by the Chairperson of the Education Commission.

If there is no possibility of obtaining the relevant experience in an industrial organization, this requirement can be met by means of unpaid work performed for periods of one month each on industrial projects at institutes in the discipline concerned, provided that evidence is given of five negative responses having been received from industrial enterprises contacted..

§ 9 Courses in Foreign Languages

Students are also required to complete courses in foreign languages equivalent to 4 hours teaching a week. If the student spends time in a non-German speaking country for degree-related reasons (student exchange / placement compulsory work experience) or writes his thesis in a discipline concerned language then this requirement is automatically fulfilled.

§ 10 Graduation Requirements

- (1) The Master examinations consist of two parts.
- (2) The first part comprises the courses stated in § 6 (1) and (2) to an extent of 63 semester hours, consisting of compulsory courses to an extent of 47 semester hours, elective courses taken from the curriculum to an extent of 10 semester hours, whereby 3 semester hours have to be taken from the field of practical experience, 2 semester hours have to be taken from the pool of seminars and 6 semester hours from the field of free elective courses according to § 4 (25) UniStG. This first part is completed upon the successful completion of all these courses.

Successfully completed courses from the elective course catalogue of the Bachelor studies Food Science and Biotechnology cannot be accredited for the Master study Biotechnology and Food Science and technology.

- (3) The course examinations may be oral and/or written, as defined by the lecturer. According to §53 (2) UniStG at least three course examination dates have to be offered per semester whereby blocked courses have to be kept in mind when fixing a date.
- (4) Free elective courses according to § 4 (25) UniStG: 6 semester hours of free elective courses have to be completed successfully. These can be taken from the complete range of offered courses at all recognised national and international universities. It is recommended that the free elective courses according to § 4 (25) UniStG be taken from the study specific elective course catalogue.
- (5) The second part of the Master examinations is oral and has to be completed as a commissioned examination and has to comprise the following: examination in the subject the Master degree thesis can be assigned to and one further subject which can be regarded as a major field of study. This second examination subject has to be determined in accordance with the dean and the student.

The registration for the second part of the Master examinations requires:

- The successful completion of the examinations stated in §(10)(2)
 - The positive evaluation of the Master degree thesis
 - Completion of a two-month Compulsory Practical Training.
- (6) The acknowledgement of courses is carried out according to the European system of accreditation of academic credentials (European Credit Transfer System – ECTS) according to § 13 Abs. 4 Z. 9 UniStG. Courses of other universities are acknowledged according to the ECTS regulations. If there is no identification according to ECTS regulations, it is referred to § 59 Abs. 1 UniStG.
 - (7) The requirement for the registration to courses Enzyme-Technological Practical Training is the successful completion of the course Laboratory Training Biochemical Exercises I.

§ 11 Transitional Regulations

- (1) Regular students who are obliged to follow the curriculum that was released on the basis of UniStG from October 1, 1999 are authorized to continue their studies according to this curriculum.

From the date the study programs for the Bachelor and Master studies come into force these students are authorized to complete their study program till September 30, 2011. If one study part is not completed within the legal duration, the student will be imputed to the curriculum of the Bachelor study program for the rest of his study period. (An admission to the Master study can only take place after the successful completion of a Bachelor study program, see also § 3).

- (2) For regular students who started their study program before the enforcement of the curriculum according to UniStG and who carry out their studies on the basis of the study regulations according to § 80 Abs. 2-4 UniStG there are no changes as far as the transitional regulations are concerned.
- (3) For students who continue their studies according to the valid curriculum a regulation (equivalence list) which was passed by the study commission is valid in which all the courses are listed which are equivalent to the Master curriculum. For students who impute to the new Bachelor and Master study program, already successfully completed examinations for courses of the old curriculum are acknowledge according to this equivalence list for the study program of this Master study curriculum.