

Note:

The following curriculum is a consolidated version. It is legally non-binding and for informational purposes only.

The legally binding versions are found in the University of Innsbruck Bulletins (in German).

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Complete Version from 1 October 2015

Curriculum for the **Master's Programme Microbiology** at the Faculty of Biology of the University of Innsbruck

§ 1 Classification of the study programme

According to §54 para. 1 Universities Act 2002 the Master's Programme Microbiology belongs to the group of studies in the Natural Sciences.

§ 2 Qualification profile

- (1) The Master's Programme Microbiology provides an in-depth scientific training based on pertinent bachelor programmes.
- (2) Graduates of the Master's Programme Microbiology have the necessary knowledge as well as the required skills and competences to find methodologically sound answers to subject-specific questions related to research in microbiology and to apply them in practice.
- (3) Graduates are able to scientifically evaluate and further develop areas of microbiology and to apply their acquired knowledge in an interdisciplinary way.
- (4) Graduates have the competence to independently develop and increase their knowledge and understanding in the field of microbiology.
- (5) Graduates are able to find scientifically sound solutions to problems based on theories and methods. This competence enables them to deal with pertinent problems of their respective professional fields backed by science and oriented towards practice. Possible professional fields:
 - scientific and managerial positions in private and public businesses and institutions (e.g. in the fields of medical and environmental technology, food production and control, pharmacy, medicine, hygiene, agriculture and forestry, environmental protection, public administration), in museums, libraries and in nature reserves.
 - jobs as consultants, experts or authorized experts (e.g. in all areas of biotechnology, medicine and hygiene, environmental protection, agriculture and forestry and water economy) for private and public businesses and institutions.
 - research and teaching at universities, universities of applied sciences and other national or international research institutions.
- (6) Graduates of the Master's Programme Microbiology have the required competences for starting a pertinent doctoral programme.

§ 3 Scope and duration

The Master's Programme Microbiology comprises 120 ECTS-Credits. This corresponds to a duration of the studies of four semesters. One ECTS-Credit corresponds to a workload of 25 hours.

§ 4 Admission

- (1) Completion of a relevant University Bachelor Programme or a relevant Bachelor Programme at a university of applied science, or completion of other equivalent studies at an accredited Austrian or non-Austrian post-secondary educational institution is required for admission to the Master's Programme Microbiology.
- (2) A completed Bachelor's Programme Biology at the University of Innsbruck is in any case a relevant study programme. The rectorate decides based on the regulations specified in the Universities Act on the admission for graduates having completed other study programmes at approved Austrian or non-Austrian post-secondary education institutions and on the equivalence of the achievements.
- (3) In the event that equivalence has been established in principle but with certain qualifications missing for full equivalence, supplemental examinations may be required. These examinations must be completed during the Master's Programme.

§ 5 Types of courses and maximum number of students per course

Safety aspects, the available rooms and the technical requirements are decisive for the maximum number of students for a course.

- (1) Courses without continuous performance assessment:

Lectures (VO) are courses held in lecture format. They introduce the research areas, methods and schools of thought for a given subject. Maximum number of participants: 300

- (2) Courses with continuous performance assessment:

- **Introductory seminars (PS)** introduce students interactively to scientific literature through the treatment of selected issues. They convey knowledge and methods of academic work. Maximum number of participants: 15-20
- **Practical courses (UE)** focus on the practical treatment of concrete scientific tasks within an area. Maximum number of participants: 6–12
- **Seminars (SE)** provide in-depth treatment of scientific topics through students' presentations and discussion thereof. Maximum number of participants: 12–30
- **Lectures with practical elements (VU)** focus on the practical treatment of concrete scientific tasks that are discussed during the lecture parts of the course. Maximum number of participants: 12–50
- **Excursions (EX)**, conducted outside the premises of the university, serve to demonstrate and deepen course contents. Maximum number of participants: 20
- **Excursions with practical elements (EU)** conducted outside the premises of the university, serve to demonstrate and deepen course contents through practical experience with concrete scientific tasks. Maximum number of participants: 14–20
- **Project studies (PJ)** promote scientific collaboration of two or more fields through the treatment of multidisciplinary topics and the use of various methods and techniques. Maximum number of participants: 6–12

§ 6 Procedure for the allotment of places in courses with a limited number of participants

The following criteria shall be applied for the allotment of places in courses with a limited number of participants:

1. Presence at the preliminary meeting (personal or represented by a proxy)
2. Students of the Master's Programme Microbiology are to be given priority.
3. Number of semesters the students have been enrolled for the Master's Programme Microbiology; Students who have been enrolled for a longer time are to be given priority.
4. By lot.

§ 7 Compulsory and elective modules

(1) The following seven compulsory modules covering 40 ECTS-Credits must be passed:

1.	Compulsory Module: Systematics of Microorganisms	h	ECTS-Credits
a.	VO Systematics of Bacteria and Archaea	1	2
b.	VO Systematics of Fungi and Fungi-Like Protists	2	3
	Total	3	5
	Objective: Students are able to structure and compare the diversity of pro- and eukaryotic microorganisms. They understand taxonomic concepts and have a knowledge of traditional (anatomy, morphology) and biomolecular methods that are used for developing such concepts.		
	Prerequisites: none		

2.	Compulsory Module: Physiology of Microorganisms	h	ECTS-Credits
a.	VO Bacterial Physiology	1	2
b.	VO Fungal Physiology	2	3
	Total	3	5
	Objective: Students explain, critically reflect on and quantitatively apply basic concepts of the subject of physiology of microorganisms. They are also able to explain the physiological specifics of mycelial, filamentous fungi.		
	Prerequisites: none		

3.	Compulsory Module: Genetics and Genomics of Microorganisms	h	ECTS-Credits
a.	VO Microbial Genomics	1	2
b.	VO Molecular Genetics	2	3
	Total	3	5

	Objective: Students understand the structure and functioning of genetic material and have knowledge of genomic research in relation to pro- and eukaryotic microorganisms. They understand the methods and working techniques applied in microbial genetics and genomics and can apply their acquired knowledge for advanced problems.
	Prerequisites: none

4.	Compulsory Module: Microbial Ecology and Biotechnology	h	ECTS-Credits
a.	VO Microbial Ecology	2	3
b.	VO Industrial Biotechnology	1	2
	Total	3	5
	Objective: Students understand the role of microorganisms in natural habitats and understand their already used and usable potential for industrial applications.		
	Prerequisites: none		

5.	Compulsory Module: Quantitative Techniques in Ecology	h	ECTS-Credits
	VU Quantitative Techniques in Ecology	2	2.5
	Total	2	2.5
	Objective: Students are able to plan complex scientific experiments and to statistically evaluate and interpret the results with suitable methods.		
	Prerequisites: none		

6.	Compulsory Module: Instructions for Scientific Working	h	ECTS-Credits
	PS Instructions for Scientific Working	1	15
	Total	1	15
	Objective: Students are able to formulate scientific questions based on the latest scientific findings for their Master's Thesis. They are able to develop hypothesis, test them with suitable methods and reflect on the results in scientific discourse.		
	Prerequisites: none		

6.	Compulsory Module: Master's Thesis Defense	h	ECTS-Credits
	Final oral defense of the Master's Thesis before an examination board		2.5
	Total		2.5
	Objective: Examination of the Master's Thesis in the overall context of the Master's Programme in Microbiology;		
	Prerequisites: positive evaluation of all other compulsory and elective modules as well as the Master's Thesis.		

(2) Elective modules corresponding to 52.5 ECTS-Credits must be passed:

1.	Elective Module: Research in Natural Science: Theory and Practice	h	ECTS-Credits
a.	SE Formulation of Hypotheses, Planning of Experiments and Data Interpretation	1	1.5
b.	UE Scientific Working with the Example of Classic Microbiologic Experiments	4	4.5
c.	SE Philosophy of Science, Ethics and Gender Research	1	1.5
	Total	6	7.5
	Objective: Students are able to formulate scientific questions and hypotheses and to plan and conduct experiments in the laboratory based on classic microbiological experiments. They get an insight into the historically important developments in microbiology and into basic aspects of the philosophy of science and gender research.		
	Prerequisites: none		

2.	Elective Module: Bacterial Physiology	h	ECTS-Credits
a.	SE Bacterial Physiology	1	1.5
b.	UE Bacterial Physiology	4	6.0
	Total	6	7.5
	Objective: Students can plan, carry out and interpret complex experiments on bacterial enzymology, the kinetics of growth, the production of secondary metabolites and nitrogen fixation.		
	Prerequisites: none		

3.	Elective Module: Bacteriology	h	ECTS-Credits
a.	VO Molecular Bacteriology	1	1.5
b.	SE Bacteriology	1	1.5
c.	UE Bacterial Diagnostics	3	4.5
	Total	5	7.5
	Objective: Students know important, specific and molecular characteristics of bacteria as basis for identifying, classifying, fighting and using them in science and research.		
	Prerequisites: none		

4.	Elective Module: Extremophilic Microorganisms	h	ECTS-Credits
a.	SE Extremophilic Microorganisms	1	1.5
b.	UE Extremophilic Microorganisms	4	6.0
	Total	5	7.5
	Objective:		

	Students know the theoretical and practical fundamentals of microbial adaptation strategies in extreme habitats. Students can plan, carry out and interpret related experiments.
	Prerequisites: none

5.	Elective Module: Anaerobic Microorganisms	h	ECTS-Credits
a.	VO Anaerobic Microorganisms	1	1.5
b.	SE Anaerobic Microorganisms	1	1.5
c.	UE Anaerobic Microorganisms	3	4.5
	Total	5	7.5
	Objective: Students understand the specific features of anaerobe metabolic processes, are able to cultivate anaerobe microorganisms (bacteria and archaea) and can plan and conduct related experiments and interpret the results.		
	Prerequisites: none		

6.	Elective Module: Molecular Microbiology and Genetic Engineering	h	ECTS-Credits
a.	SE Molecular Microbiology and Genetic Engineering	1	1.5
b.	UE Molecular Microbiology and Genetic Engineering	4	6
	Total	5	7.5
	Objective: Students are familiar with the theoretic fundamentals of molecular microbiology and microbial genetic engineering and can apply their knowledge for genetically modifying and characterizing prokaryotes and low-level eukaryotes. Students are able to independently apply working methods of molecular biology, make protocols and interpret and discuss their results.		
	Prerequisites: none		

7.	Elective Module: Molecular Phylogeny and Biochemistry of Fungi	h	ECTS-Credits
a.	VO Molecular Mycology – Signal Transduction and Communication in Fungi	1	2
b.	VO Phylogeny	1	2
c.	VO Molecular Mechanisms of Biopolymer Degradation by Fungi	2	3.5
	Total	4	7.5
	Objective: Students are familiar with the fundamentals of molecular phylogeny and can apply them in practice. They have an understanding of molecular mechanisms in signal transduction and of biopolymer degradation by fungi and have knowledge of the current state of research.		
	Prerequisites: none		

8.	Elective Module: Fungal Physiology	h	ECTS-Credits
a.	SE Fungal Physiology	1	1.5
b.	UE Fungal Physiology	4	6
	Total	5	7.5
	Objective: Students can grow filamentous fungi in a bioreactor, record a growth curve, watch the concentration of the main nutrients and calculate and interpret quantitative parameters for describing their growth process, their physiological state and product formation.		
	Prerequisites: none		

9.	Elective Module: Biodiversity of Fungi and Fungi-Like Protists	h	ECTS-Credits
a.	SE Biodiversity of Fungi and Fungi-Like Protists	1	1.5
b.	UE Biodiversity of Fungi and Fungi-Like Protists	4	6
	Total	5	7.5
	Objective: Students get familiar with selected groups of eukaryotic microorganisms by studying examples. They understand the ecological and economic importance of different organisms from various groups.		
	Prerequisites: none		

10.	Elective Module: Medical Mycology	h	ECTS-Credits
a.	SE Medically Relevant Fungi	1	1.5
b.	UE Medically Relevant Fungi	4	6
	Total	5	7.5
	Objective: Students are able to recognize the most important pathogens of mycoses. They are familiar with the advantages and disadvantages of classic diagnostic methods (cultivation techniques, morphology, histology) and molecular diagnostics.		
	Prerequisites: none		

11.	Elective Module: Food-Borne Fungi	h	ECTS-Credits
a.	SE Food-Borne Fungi	1	1.5
b.	UE Food-Borne Fungi	4	6
	Total	5	7.5
	Objective: Students are familiar with the most important methods for detecting and identifying of food-borne fungi and know how to prevent damage. They are able to check the quality and origin of fungal food and food made by the aid of fungi.		
	Prerequisites: none		

12.	Elective Module: Fungal Diversity of Terrestrial Habitats	h	ECTS-Credits
a.	SE Function of Use of Fungi in Habitats	1	1
b.	EX Live Mycology – Recognizing and Identifying Fungi in their Habitats	4	4
	Total	5	5
<p>Objective: Students are able to recognize fungi in a selected habitat. They can classify the most common and important types of fungi there and identify their species and class. They are able to recognize important morphological features and are familiar with basic microscopic techniques for identifying fungi. They are also familiar with the ecological function of selected groups of fungi and can apply this knowledge – based on typical features – to other groups of fungi.</p>			
Prerequisites: none			

13.	Elective Module: Mutualistic Symbiosis	h	ECTS-Credits
a.	SE Mutualistic Symbiosis	1	1.5
b.	UE Mutualistic Symbiosis	4	6
	Total	5	7.5
<p>Objective: Students understand the function and importance of mutualistic interactions of organisms with the example of mycorrhiza. They are able to plan, conduct and interpret the results experiments in the outdoors, take samples, quantify mycorrhiza systems and to identify the symbiotic partners by using classic and molecular methods.</p>			
Prerequisites: none			

14.	Elective Module: Soil Microbiology	h	ECTS-Credits
a.	SE Soil Microbiology	1	1.5
b.	UE Soil Microbiology	4	6
	Total	5	7.5
<p>Objective: Students can independently examine current issues in soil microbiology by applying pedological, chemical, micro- and molecular-biological methods and to interpret the gained results in a statistically sound way. Students understand the varied functions of microorganisms in soil and understand their importance for the global cycle of materials. They understand soil as precious resource for all terrestrial ecosystems that is worth protecting.</p>			
Prerequisites: none			

15.	Elective Module: Microbial Ecology	h	ECTS-Credits
a.	SE Techniques in Microbial Ecology	1	1.5
b.	UE Structure and Function of Microbiota	4	6
	Total	5	7.5

	Objective: Students understand scientific papers in the field of microbial ecology and are able to present them abridged to an audience. Having planned and conducted experiments and analyzed the data, students are able to understand and describe the structure and function of microbiota.
	Prerequisites: none

16.	Elective Module: Environmental Microbiology 1	h	ECTS-Credits
a.	SE Environmental Microbiology	1	1.5
b.	UE Environmental Microbiology	4	6
	Total	5	7.5
	Objective: Students are familiar with theoretical and practical fundamentals of the impact of pollutants on microorganisms and understand the biotechnological importance of these environmental-microbiological processes. They are able to plan, conduct and analyze experiments and to interpret the results.		
	Prerequisites: none		

17.	Elective Module: Environmental Microbiology 2	h	ECTS-Credits
a.	VO Molecular Microbial Ecology	1	1.5
b.	UE Biodegradation	4	6
	Total	5	7.5
	Objective: Students are able to investigate microbiota of different habitats and microbial activities during biological degradation of natural materials with DNA and RNA-based methods. They are able to plan and conduct experiments and interpret the results with respect to classic microbiological methodology.		
	Prerequisites: none		

18.	Elective Module: Molecular Physiology and Biotechnology	h	ECTS-Credits
a.	SE Molecular Physiology and Biotechnology	1	1.5
b.	VU Molecular Physiology and Biotechnology	4	6
	Total	5	7.5
	Objective: Students are familiar with the fundamentals and techniques applied in molecular fungal biotechnology and have knowledge of the relevant cell biologic processes and methods required for strain optimization. They are familiar with basic molecular working techniques and are able to interpret, document, present and discuss experiments in molecular biology.		
	Prerequisites: none		

19.	Elective Module Bioprocess Engineering and Biotechnology	h	ECTS-Credits
a.	VO Fundamentals of Bioprocess Engineering	2	3.5
b.	VO Medical Biotechnology	1	1.5
	Total	3	5
Objective: Students are familiar with the most important fundamentals of biotechnical processes. They recognize the area of conflict between modern biotechnical possibilities and the ecological and social (regulative) framework based on examples of medical biotechnology.			
Prerequisites: none			

20.	Elective Module: Applied Bioprocess Engineering	h	ECTS-Credits
a.	SE Applied Bioprocess Engineering	1	1.5
b.	PJ Applied Bioprocess Engineering	5	6
	Total	6	7.5
Objective: With the intensive investigation of a practical problem relating to bioprocess engineering students learn about the most important components of project work from task definition, making of a project plan, coordination of a project team, formulation and communication of the state of knowledge, conducting of experiments including protocols to the interpretation and presentation to the client.			
Prerequisites: none			

21.	Elective Module: Waste Management	h	ECTS-Credits
a.	VO Waste Management	1	1.5
b.	UE Biogas	3	4.5
c.	SE Biowaste Treatment Technologies	1	1.5
	Total	5	7.5
Objective: Students know about the importance of recycling of biowaste. They are familiar with the legal framework and the ecological requirements. They also have an in-depth, application-orientated knowledge of one of the methods of biomethanization.			
Prerequisites: none			

22.	Elective Module: Phytopathology and Plant Protection	h	ECTS-Credits
a.	VO Phytopathology	1	1.5
b.	SE Biological Plant Protection	1	1.5
c.	UE Biological Pest Control	3	4.5
	Total	5	7.5

	<p>Objective: Students are familiar with the fundamentals of integrated plant protection. They understand the interactions between phytopathogen and plant and know about the possibilities of biological pest and disease control in agriculture. They know about the requirements and quality standards of biologic agents that are necessary for applying them in plant protection, they can assess risks and know how to organize studies in effectiveness.</p>
	<p>Prerequisites: none</p>

23.	Elective Module: Geomicrobiology	h	ECTS-Credits
a.	SE Geomicrobiology	1	1.5
b.	UE Geomicrobiology	4	6
	Total	5	7.5
	<p>Objective: Students are able to work out the theoretical and practical fundamentals of geomicrobiology and to discuss and present their ecological and biotechnical importance. They are familiar with cultivation-technical and analytic methods for conducting geomicrobiological experiments and are able to present and interpret the results.</p>		
	<p>Prerequisites: none</p>		

24.	Elective Module: Food Microbiology	h	ECTS-Credits
a.	SE Food Microbiology	1	1.5
b.	UE Food Microbiology	4	6
	Total	5	7.5
	<p>Objective: With experiments that are closely related to practice students gain in-depth knowledge of food production by using biotechnological processes, they are familiar with prevalent micro- and molecular-biological methods for quality assurance and are able to recognize spoilt food and assess it based on respective regulations.</p>		
	<p>Prerequisites: none</p>		

25.	Elective Module: Microbiology in Practice	h	ECTS-Credits
a.	SE Microbiology in Practice	1	1
b.	EX Microbiology in Practice	4	4
	Total	5	5
	<p>Objective: On visits to businesses in the fields of environmental technology, food biotechnology and pharmaceutical biotechnology students learn about the theory and actual use of microorganisms and the role of microbiologists in practice.</p>		
	<p>Prerequisites: none</p>		

26.	Elective Module: Medical Microbiology	h	ECTS-Credits
a.	VU Medical Microbiology	3	3.5
b.	SE Medical Microbiology	1	1.5
	Total	4	5
	Objective: Students are able to describe and discuss medical aspects of microbiology and of the human microbiome. They are able to independently deal with specific questions by using scientific methods.		
	Prerequisites: none		

27.	Elective Module: Special Aspects of Medical Microbiology	h	ECTS-Credits
a.	VO Selected Chapter in Immunobiology	1	1
b.	VO Toxicology II	1	1
c.	VO Virology	2	3
	Total	4	5
	Objective: Students recognize and understand special aspects of immunobiology, toxicology and virology.		
	Prerequisites: none		

28.	Elective Module: Selected Chapters of Microbiology I	h	ECTS-Credits
	VU Selected Chapters of Microbiology I	1	2.5
	Total	1	2.5
	Objective: In this module, which is offered now and again, students get in-depth insights into sub-disciplines of microbiology or related sciences that are not covered by electives modules 1-27.		
	Prerequisites: none		

29.	Elective Module: Selected Chapters of Microbiology II	h	ECTS-Credits
	VU Selected Chapters of Microbiology II	3	5
	Total	3	5
	Objective: In this module, which is offered now and again, students get in-depth insights into sub-disciplines of microbiology or related sciences that are not covered by electives modules 1–28.		
	Prerequisites: none		

30.	Elective Module: Special Topics of Microbiology	h	ECTS-Credits
a.	SE Special Topics of Microbiology	1	1.5
b.	UE Special Topics of Microbiology	4	6
	Total	5	7.5
	Objective: Students have knowledge in special topics of microbiology and related sciences.		
	Prerequisites: none		

31.	Elective Module: Module from other Master Programmes of the Faculty of Biology	h	ECTS-Credits
	A module from another Master Programme of the Faculty of Biology of the University of Innsbruck can be passed.		5
	Total		5
	Objective: The objectives defined by the respective module give the students insights into another field of biology.		
	Prerequisites: The prerequisites specified by the respective curricula must be met.		

32.	Elective Module: Interdisciplinary Skills	h	ECTS-Credits
	Courses corresponding to 7.5 ECTS-Credits and providing to availability of places can be freely chosen from the curricula of the Master and/or Diploma Programmes at the University of Innsbruck.		7.5
	Total		7.5
	Objective: This module serves to expand the study programme and to acquire additional qualifications.		
	Prerequisites: The prerequisites specified by the respective curricula must be met.		

§ 8 Master's Thesis

- (1) Students of the Master's Programme Microbiology have to write a Master's Thesis equaling to 27.5 ECTS credits. The Master's Thesis is a scientific piece of work which serves to prove the student's ability to autonomously cope with scientific questions using adequate scientific methods
- (2) Possible topics include all questions related to increasing knowledge in modern research in microbiology.
- (3) Students are entitled to write their Master's Thesis in English if their supervisor agrees to it.
- (4) It is possible for several students to work on one topic, if it is possible to separately evaluate the achievements of the individual students.

§ 9 Examination regulations

- (1) Modules are evaluated by module examinations. Module examinations are examinations that serve to prove the knowledge and skills acquired in a module. If all parts of a module examination have been positively evaluated, the respective module is passed.
- (2) The courses of the modules are evaluated by means of course examinations. Course examinations are
 1. examinations that serve to demonstrate the knowledge and skills gained in a single course and where the performance is assessed with a single exam at the end of the course. The course lecturer must communicate the examination method (written and/or oral) and the evaluation criteria before the start of the course.
 2. examinations on courses with continuous performance assessment, where the evaluation is based on the student's regular, written and/or oral contributions. The course lecturer must communicate the examination method (written and/or oral) and the evaluation criteria before the start of the course.
- (3) Assessment of the compulsory module 7 (Master's Thesis Defense) is based on an oral exam before an examination board consisting of at least three examiners.

§ 10 Academic degree

Graduates of the Master's Programme in Microbiology are awarded the academic degree of "Master of Science", abbreviated as "MSc".

§ 11 Coming into Force

- (1) This curriculum comes into force on 1 October 2008.
- (2) The modification of the curriculum in the version of the University of Innsbruck Bulletin of 6 May 2015, Issue 26, No. 386 comes into force on 1 October 2015 and is to be applied to all students.

§ 12 Transitional Provisions

- (1) Positively passed elective modules according to the regulations of the curriculum for the Master's Programme in Microbiology in the version of the University of Innsbruck Bulletin of 29 April 2008, Issue 37, No. 266 (in the following referred to as curriculum 2008) count as elective modules for the curriculum in the version of the University of Innsbruck Bulletin of 6 May 2015, Issue 26, No. 386 (in the following referred to as curriculum of 2015).
- (2) Elective modules of the curriculum 2015 that have the same contents as a passed elective module of the curriculum 2008 or contain a course according to the curriculum 2008 may not be passed. A list of courses that may not be taken is published on the homepage of the Faculty of Biology.
- (3) An equivalence list for compulsory modules and their courses as well as for individual passed courses of elective modules is to be published by the Director of Studies.