

English translation from the German. The translation is for information only; legally binding is only the German original in its currently applicable version. Effective from October 2018.



**FRIEDRICH-SCHILLER-
UNIVERSITÄT
JENA**

Module Catalogue for the Master Degree Program Microbiology (M.Sc.)

Faculty of Biological Sciences

List of abbreviations: cp credit point(s), L Lecture, S Seminar, E Exercise, P Practical course, EX Excursion, SoS Summer Semester, WS Winter Semester, hpw hours per week, Mc Module coordinator

English translation from the German. The translation is for information only; legally binding is only the German original in its currently applicable version. Effective from October 2018.

Module descriptions

Module number	MMB001
Module name	Introduction into Microbiology
Module coordinator	Krause
Admission requirements	none
Usability (required for)	Advanced modules, Project and Specialization module
Type of module (compulsory, compulsory elective module)	Compulsory module: Basic module
Frequency of offer (module cycle)	Yearly
Duration of module	2 semesters
Module composition/ Forms of instruction (lecture, seminar, exercise, practical course)	E exercise to microbiology, block in the first week of lecture (2 hpw) S Microbial Communication Colloquium, during 2 semesters bi-weekly (2 hpw) S Scientific Methods (1 hpw)
Credit points (ECTS credits)	6
Workload in hours: - in class and - self-study (incl. examination preparation)	- 75 - 105
Contents	Organized by 3rd semester students, the exercise introduces techniques in microbiology to level different entrance levels among the study course. The seminar will introduce the subjects of BSc theses of the participants to show the width of microbiology. In self-study phylogeny, physiology and molecular biology are studied for the three domains of life. The "Microbial Communication Colloquium" introduces modern scientific subjects and methods in microbiology.
Learning and qualification objectives	Basic methods in microbiology like media preparation, plating, pipetting (E) are trained and an overview on current subjects in microbiology (S) are studied. Regular participation in the practical exercise, the seminar and the colloquium are required to reach the study objectives of the module. The teaching staff will inform about further details at the beginning of the courses.
Admission requirements for the module examination	Seminar contribution (passed)
Requirements for the award of credit points (forms of examination, weighting of grades in %)	Oral examination on basic microbiology at the end of the 2nd semester (100 %)

English translation from the German. The translation is for information only; legally binding is only the German original in its currently applicable version. Effective from October 2018.

Module number	MMB002
Module name	Microbial Physiology
Module coordinator	N.N.
Admission requirements	none
Usability (required for)	Advanced modules, Project and Specialization module
Type of module (compulsory, compulsory elective module)	Compulsory module: Basic module
Frequency of offer (module cycle)	Yearly
Duration of module	1 semester
Module composition/ Forms of instruction (lecture, seminar, exercise, practical course)	Practical course, block 4 weeks half-day; V 2 hpw
Credit points (ECTS credits)	8
Workload in hours: - in class and - self-study (incl. examination preparation)	- 105 - 135
Contents	The lecture contains selected energy metabolism pathways in bacteria and archaea with specific impact of ecological impacts. In the course, the fermentation metabolism is characterized including chemical and physical analytic techniques. The results of the course are summarized in a protocol.
Learning and qualification objectives	An overview on selected energy metabolic pathways and element cycles (L), growth and cell fractioning, analytical and molecular biology methods, characterization of proteins and mutants (P). Regular participation in the practical course is required to reach the study objectives of the module. The teaching staff will inform about further details at the beginning of the courses.
Admission requirements for the module examination	Seminar talk in the practical course (passed)
Requirements for the award of credit points (forms of examination, weighting of grades in %)	Protocol to the practical course (100 %)

English translation from the German. The translation is for information only; legally binding is only the German original in its currently applicable version. Effective from October 2018.

Module number	MMB003
Module name	Microbial Communication
Module coordinator	Kothe
Admission requirements	None
Usability (required for)	Advanced modules, Project and Specialization module
Type of module (compulsory, compulsory elective module)	Compulsory module: Basic module
Frequency of offer (module cycle)	Yearly
Duration of module	1 semester
Module composition/ Forms of instruction (lecture, seminar, exercise, practical course)	Practical course, block 4 weeks half-day; V 2 hpw
Credit points (ECTS credits)	8 cp
Workload in hours: - in class and - self-study (incl. examination preparation)	- 105 - 135
Contents	Basic microbiology and molecular biology techniques (including -omics technologies) are introduced and investigation of secondary metabolites is shown. Specific impact is on strategies for interactions with the environment, between microorganisms and of microbes with their plant host (P). Examples include secondary metabolite production or molecular mechanisms in bacteria and fungi (L).
Learning and qualification objectives	Knowledge and skills in microbiology (P); presentation of results in the form of publications as basis for the Master thesis; knowledge in molecular interactions (L). Regular participation in the practical course is required to reach the study objectives of the module. The teaching staff will inform about further details at the beginning of the courses.
Admission requirements for the module examination	Seminar talk in the practical course (passed)
Requirements for the award of credit points (forms of examination, weighting of grades in %)	Protocol to the practical course (100 %)

English translation from the German. The translation is for information only; legally binding is only the German original in its currently applicable version. Effective from October 2018.

Module number	MMB004
Module name	Microbial Interactions
Module coordinator	N.N.
Admission requirements	None
Usability (required for)	Advanced modules, Project and Specialization module
Type of module (compulsory, compulsory elective module)	Compulsory module: Basic module
Frequency of offer (module cycle)	Yearly
Duration of module	1 semester
Module composition/ Forms of instruction (lecture, seminar, exercise, practical course)	Practical course, block 4 weeks half-day; V 2 hpw
Credit points (ECTS credits)	8
Workload in hours: - in class and - self-study (incl. examination preparation)	- 105 - 135
Contents	Methods in microbiology and molecular biology for the analysis of microbial communities and microbiomes as well as the analysis of interactions are given (P). Examples for symbiotic, parasitic and commensal interactions are introduced (L).
Learning and qualification objectives	Knowledge and skills in microbiology (P); presentation of results in the form of an extended protocol; knowledge in molecular interactions (L). Regular participation in the practical course is required to reach the study objectives of the module. The teaching staff will inform about further details at the beginning of the courses.
Admission requirements for the module examination	Seminar talk in the practical course (passed)
Requirements for the award of credit points (forms of examination, weighting of grades in %)	Protocol to the practical course (100 %)

English translation from the German. The translation is for information only; legally binding is only the German original in its currently applicable version. Effective from October 2018.

Module number	MMB005
Module name	Microbiology and Molecular Biology
Module coordinator	Brakhage
Admission requirements	None
Usability (required for)	Advanced modules, Project and Specialization module
Type of module (compulsory, compulsory elective module)	Compulsory module: Basic module
Frequency of offer (module cycle)	Yearly
Duration of module	1 semester
Module composition/ Forms of instruction (lecture, seminar, exercise, practical course)	Practical course 5 hpw, blocked; L 2 hpw
Credit points (ECTS credits)	8
Workload in hours: - in class and - self-study (incl. examination preparation)	- 105 - 135
Contents	The module contains basic methods in molecular biology and microbiology. A focus is on production of genetically modified fungi and bacteria (P). Different transformation strategies are presented and mutants characterized on a molecular level. The capacity of microorganisms to form secondary metabolites is presented (L).
Learning and qualification objectives	Knowledge and skills in molecular microbiology (P); presentation of scientific publications; molecular biology of microorganisms (L). Regular participation in the practical course is required to reach the study objectives of the module. The teaching staff will inform about further details at the beginning of the courses.
Admission requirements for the module examination	Seminar talk in the practical course (passed)
Requirements for the award of credit points (forms of examination, weighting of grades in %)	Protocol to the practical course (100 %)

English translation from the German. The translation is for information only; legally binding is only the German original in its currently applicable version. Effective from October 2018.

Module number	MMB006
Module name	Adaptation in Microorganisms
Module coordinator	N.N.
Admission requirements	1 Basic module
Usability (required for)	Advanced modules, Project and Specialization module
Type of module (compulsory, compulsory elective module)	Compulsory module: Elective
Frequency of offer (module cycle)	Yearly
Duration of module	1 semester
Module composition/ Forms of instruction (lecture, seminar, exercise, practical course)	P 5 hpw, blocked, 4 weeks half-day; L 2 hpw; S 1 hpw
Credit points (ECTS credits)	10
Workload in hours: - in class and - self-study (incl. examination preparation)	- 120 - 180
Contents	Bacteria and fungi are grown and specific adaptation are shown. Different strategies for microbial metabolism in distinct niches and the theoretical requirements for adaptation are central subjects. The practical course employs specific methods. The seminar gives insight into actual original research papers on microbiology subjects.
Learning and qualification objectives	Theoretical basics (L) and methods for adaptation are learned (P), original papers and techniques (S) are presented. Regular participation in the practical course is required to reach the study objectives of the module. The teaching staff will inform about further details at the beginning of the courses.
Admission requirements for the module examination	Seminar talk (passed)
Requirements for the award of credit points (forms of examination, weighting of grades in %)	Protocol to the practical course (100 %)

English translation from the German. The translation is for information only; legally binding is only the German original in its currently applicable version. Effective from October 2018.

Module number	MMB007
Module name	Molecular Communication in Basidiomycetes
Module coordinator	Kothe
Admission requirements	1 Basic module
Usability (required for)	Advanced modules, Project and Specialization module
Type of module (compulsory, compulsory elective module)	Compulsory module: Elective
Frequency of offer (module cycle)	Yearly
Duration of module	1 semester
Module composition/ Forms of instruction (lecture, seminar, exercise, practical course)	P 5 hpw, blocked, 4 weeks half-day; L 2 hpw; S 1 hpw (alternatively as E); Excursion
Credit points (ECTS credits)	10
Workload in hours: - in class and - self-study (incl. examination preparation)	- 120 - 180
Contents	The lecture introduces higher fungi of the group of dikarya; alternatively the subjects can be prepared in a home work (L or E). The research focussed practical course is directed at approaches, which can be used for a master's thesis in each part of microbiology (P). Molecular mechanisms of cell biology and fundamentals of communication in fungi are treated, e. g. the phenotypic characterization of transformants which overexpress mutant proteins of intracellular signal transduction. Methods of gene identification and database analysis are trained.
Learning and qualification objectives	Overview and detailed knowledge on the phylogeny and systematics/taxonomy (L); cell biology and molecular genetics of eukaryotes (P) and focussing on research topics (S) are trained. Regular participation in the practical course is required to reach the study objectives of the module. The teaching staff will inform about further details at the beginning of the courses.
Admission requirements for the module examination	Seminar talk (passed)
Requirements for the award of credit points (forms of examination, weighting of grades in %)	Protocol to the practical course (100 %)

English translation from the German. The translation is for information only; legally binding is only the German original in its currently applicable version. Effective from October 2018.

Module number	MMB008
Module name	Microbial Consortia
Module coordinator	N.N.
Admission requirements	1 Basic module
Usability (required for)	Advanced modules, Project and Specialization module
Type of module (compulsory, compulsory elective module)	Compulsory module: Elective
Frequency of offer (module cycle)	Yearly
Duration of module	1 semester
Module composition/ Forms of instruction (lecture, seminar, exercise, practical course)	P 5 hpw, blocked, 4 weeks half-day; L 2 hpw; S 1 hpw
Credit points (ECTS credits)	10
Workload in hours: - in class and - self-study (incl. examination preparation)	- 120 - 180
Contents	The interrelationships in microbial consortia are introduced and mechanisms of cross-talk introduced (L, S). Analyses using DNA-dependent and cultivation strategies are trained and microbiome analyses shown (P).
Learning and qualification objectives	Preparation of complex subjects (L) with new literature (S); microbiome analyses (P). Regular participation in the practical course is required to reach the study objectives of the module. The teaching staff will inform about further details at the beginning of the courses.
Admission requirements for the module examination	Seminar talk (passed)
Requirements for the award of credit points (forms of examination, weighting of grades in %)	Protocol to the practical course (100 %)

English translation from the German. The translation is for information only; legally binding is only the German original in its currently applicable version. Effective from October 2018.

Module number	MMB009
Module name	Molecular Infection Biology of lower Eukaryotes
Module coordinator	Brakhage
Admission requirements	1 Basic module
Usability (required for)	Advanced modules, Project and Specialization module
Type of module (compulsory, compulsory elective module)	Compulsory module: Elective
Frequency of offer (module cycle)	Yearly
Duration of module	1 semester
Module composition/ Forms of instruction (lecture, seminar, exercise, practical course)	P 5 hpw, blocked, 4 weeks half-day; L 2 hpw; S 1 hpw
Credit points (ECTS credits)	10
Workload in hours: - in class and - self-study (incl. examination preparation)	- 120 - 180
Contents	Molecular biology (gene regulation, signal transduction, genomics) of eukaryotic microorganisms; biotechnology of the production of proteins, antibiotics, amino acids; combinatorial biosynthesis, secondary metabolism. Transcriptome and proteome analysis.
Learning and qualification objectives	Overview and deepened knowledge of molecular biology (L), genomics and biotechnology of fungi (P). Regular participation in the practical course is required to reach the study objectives of the module. The teaching staff will inform about further details at the beginning of the courses.
Admission requirements for the module examination	none
Requirements for the award of credit points (forms of examination, weighting of grades in %)	Written exam to L (70 %), Protocols to P (30 %)

English translation from the German. The translation is for information only; legally binding is only the German original in its currently applicable version. Effective from October 2018.

Module number	MMB010
Module name	Biotechnology - Bioelectrochemistry
Module coordinator	Rosenbaum
Admission requirements	1 Basic module
Usability (required for)	Advanced modules, Project and Specialization module
Type of module (compulsory, compulsory elective module)	Compulsory module: Elective
Frequency of offer (module cycle)	Yearly
Duration of module	1 semester
Module composition/ Forms of instruction (lecture, seminar, exercise, practical course)	Practical course 2 hpw, blocked, 2 weeks half-day; L 2 hpw,
Credit points (ECTS credits)	5
Workload in hours: - in class and - self-study (incl. examination preparation)	- 60 - 90
Contents	Electricity generating bacteria? Microorganisms convert electric currents and carbon dioxide into chemicals? Electron transfer through isolating cell walls? After giving the basics for biotechnology and engineering, those and other applications of bioelectrochemistry are introduced. A focus is put on knowledge concerning the basic microbial processes. In a project, potential applications for bioelectrochemical systems are developed by the students and practically implemented.
Learning and qualification objectives	Basics in bioelectrochemistry on enzymatic and microbial processes (L), physiology of bacteria as biocatalytic actors at electrodes, technical application (P). Regular participation in the practical course is required to reach the study objectives of the module. The teaching staff will inform about further details at the beginning of the courses.
Admission requirements for the module examination	Application proposal (passed)
Requirements for the award of credit points (forms of examination, weighting of grades in %)	Protocol to the practical course (100 %)

English translation from the German. The translation is for information only; legally binding is only the German original in its currently applicable version. Effective from October 2018.

Module number	MMB011
Module name	Molecular und Microbial Infection Biology
Module coordinator	Hube
Admission requirements	1 Basic module
Usability (required for)	Advanced modules, Project and Specialization module
Type of module (compulsory, compulsory elective module)	Compulsory module: Elective
Frequency of offer (module cycle)	Yearly
Duration of module	1 semester
Module composition/ Forms of instruction (lecture, seminar, exercise, practical course)	Practical course 2 hpw, blocked, usually 1 week full-day; L 2 hpw
Credit points (ECTS credits)	5
Workload in hours: - in class and - self-study (incl. examination preparation)	- 60 - 90
Contents	Molecular biology, microbiology and infection biology of human-pathogenic bacteria, parasites and fungi. General principles are compared in more depth discussed with examples. In the practical course, molecular biology for the investigation of human-pathogenic yeasts of the genus <i>Candida</i> are presented and applied with a focus on gene expression of virulence factors and host-pathogen interaction combined with mutant mutation and characterization in pathogenic fungi.
Learning and qualification objectives	Overview and deepened knowledge of molecular biology / microbiology / infection biology of human pathogenic fungi (P, S). Regular participation in the practical course is required to reach the study objectives of the module. The teaching staff will inform about further details at the beginning of the courses.
Admission requirements for the module examination	none
Requirements for the award of credit points (forms of examination, weighting of grades in %)	Written exam (60 %), Seminar talk, experimental work and protocols in P (40 %)

English translation from the German. The translation is for information only; legally binding is only the German original in its currently applicable version. Effective from October 2018.

Module number	MMB012
Module name	Immune reactions of humans to Microorganisms and Pathogens
Module coordinator	Zipfel
Admission requirements	1 Basic module
Usability (required for)	Advanced modules, Project and Specialization module
Type of module (compulsory, compulsory elective module)	Compulsory module: Elective
Frequency of offer (module cycle)	Yearly
Duration of module	1 semester
Module composition/ Forms of instruction (lecture, seminar, exercise, practical course)	L 2 hpw, P 2 hpw, blocked, 1 week full-day
Credit points (ECTS credits)	5
Workload in hours: - in class and - self-study (incl. examination preparation)	- 60 - 90
Contents	Immune reactions of humans against microorganisms and pathogens, immune evasion of pathogens and microorganisms, genetic susceptibility for infections, methods in immune and infection biology
Learning and qualification objectives	Overview and deepened knowledge of immune biology (L), molecular biology, infection biology (P). Regular participation in the practical course is required to reach the study objectives of the module. The teaching staff will inform about further details at the beginning of the courses.
Admission requirements for the module examination	None
Requirements for the award of credit points (forms of examination, weighting of grades in %)	Written exam (70 %), protocols or talk in P (30 %)

English translation from the German. The translation is for information only; legally binding is only the German original in its currently applicable version. Effective from October 2018.

Module number	MMB013
Module name	Biomolecular Chemistry
Module coordinator	Hertweck
Admission requirements	1 Basic module
Usability (required for)	Advanced modules, Project and Specialization module
Type of module (compulsory, compulsory elective module)	Compulsory module: Elective
Frequency of offer (module cycle)	Yearly
Duration of module	1 semester
Module composition/ Forms of instruction (lecture, seminar, exercise, practical course)	L 2 SWS, P 2 SWS, blocked, usually 1 week full-day
Credit points (ECTS credits)	5
Workload in hours: - in class and - self-study (incl. examination preparation)	- 60 - 90 the preceding lecture on natural product chemistry of BSc Biochemistry is strongly advised
Contents	Biology and chemistry of natural compounds from microorganisms, structures of natural compounds, biosyntheses, screening methods, chemical analysis and molecular biological analysis of biosynthesis genes. Knowledge of the lecture in winter semester is required (can be accepted alternatively)
Learning and qualification objectives	Overview (L) and deepened knowledge (P) of the biology and chemistry of natural compounds from microorganisms. Regular participation in the practical course is required to reach the study objectives of the module. The teaching staff will inform about further details at the beginning of the courses.
Admission requirements for the module examination	None
Requirements for the award of credit points (forms of examination, weighting of grades in %)	Oral or written exam (100 %)

English translation from the German. The translation is for information only; legally binding is only the German original in its currently applicable version. Effective from October 2018.

Module number	MMB014
Module name	Geomicrobiology
Module coordinator	Küsel
Admission requirements	1 Basic module
Usability (required for)	Advanced modules, Project and Specialization module
Type of module (compulsory, compulsory elective module)	Compulsory module: Elective
Frequency of offer (module cycle)	Yearly
Duration of module	2 semesters (!)
Module composition/ Forms of instruction (lecture, seminar, exercise, practical course)	L 2 hpw (in winter semester), P 2 hpw, blocked, usually 1 week
Credit points (ECTS credits)	5
Workload in hours: - in class and - self-study (incl. examination preparation)	- 60 - 90
Contents	The module deals with the importance of microbial processes in aquatic habitats. The lecture will give an overview about the origin of life on early Earth, the evolution of metabolic diversity and the interaction of microbes with minerals. We will also highlight the importance of recently discovered processes like anaerobic methane oxidation or annamox in marine and freshwater ecosystems. In the seminar and practical course, specific microbial processes in an aquatic habitat will be studied with biogeochemical methods in the field and molecular analyses. A lecture during winter semester provides necessary knowledge.
Learning and qualification objectives	Importance of microorganisms for element cycles during 4 billions of years (P); overview of the current research (S). Regular participation in the practical course is required to reach the study objectives of the module. The teaching staff will inform about further details at the beginning of the courses.
Admission requirements for the module examination	None
Requirements for the award of credit points (forms of examination, weighting of grades in %)	Written exam (50%), protocol (50%)

English translation from the German. The translation is for information only; legally binding is only the German original in its currently applicable version. Effective from October 2018.

Module number	MMB015
Module name	Biomolecular Chemistry
Module coordinator	Boland
Admission requirements	1 Basic module
Usability (required for)	Advanced modules, Project and Specialization module
Type of module (compulsory, compulsory elective module)	Compulsory module: Elective
Frequency of offer (module cycle)	Yearly
Duration of module	1 semester
Module composition/ Forms of instruction (lecture, seminar, exercise, practical course)	S 2 SWS; P 2 SWS, blocked
Credit points (ECTS credits)	5
Workload in hours: - in class and - self-study (incl. examination preparation)	- 60 - 90
Contents	Introduction into ecological and evolutionary theory of interactions, molecular mechanisms of evolution, levels of selection, individuality, and the evolution of cooperation. The evolution of sex and life-histories.
Learning and qualification objectives	A basic understanding of fundamental (chemical) ecological and evolutionary principles and concepts with a particular focus on microorganisms (P). Participants will practice to introduce a complex topic (S). Regular participation in the practical course is required to reach the study objectives of the module. The teaching staff will inform about further details at the beginning of the courses.
Admission requirements for the module examination	None
Requirements for the award of credit points (forms of examination, weighting of grades in %)	Protocol to P (100%)

English translation from the German. The translation is for information only; legally binding is only the German original in its currently applicable version. Effective from October 2018.

Module number	MMB016
Module name	Translational Medical Microbiology
Module coordinator	Jacobsen
Admission requirements	1 Basic module
Usability (required for)	Advanced modules, Project and Specialization module
Type of module (compulsory, compulsory elective module)	Compulsory module: Elective
Frequency of offer (module cycle)	Yearly
Duration of module	1 semester
Module composition/ Forms of instruction (lecture, seminar, exercise, practical course)	L 2 SWS; P 2 SWS, blocked
Credit points (ECTS credits)	5
Workload in hours: - in class and - self-study (incl. examination preparation)	- 60 - 90
Contents	The lecture introduces medical microbiology focusing on applied aspects. Central is the work with human materials for research in infection biology.
Learning and qualification objectives	Methods in translational medical microbiology, legal framework for working with pathogens and protective measures (S), detection of pathogens, analysis of pathogen-host interaction with cell biology methods, detection of antibodies and antigen specific T-cell response (P). Regular participation in the practical course is required to reach the study objectives of the module. The teaching staff will inform about further details at the beginning of the courses.
Admission requirements for the module examination	Prepared subject presentation in P (passed)
Requirements for the award of credit points (forms of examination, weighting of grades in %)	Protocol to the practical course (100 %)

English translation from the German. The translation is for information only; legally binding is only the German original in its currently applicable version. Effective from October 2018.

Module number	MMB017
Module name	Microbe-Plant Interactions
Module coordinator	Kothe
Admission requirements	1 Basic module
Usability (required for)	Advanced modules, Project and Specialization module
Type of module (compulsory, compulsory elective module)	Compulsory module: Elective
Frequency of offer (module cycle)	Yearly
Duration of module	1 semester
Module composition/ Forms of instruction (lecture, seminar, exercise, practical course)	P 2 hpw, blocked, 2 weeks half-day, S 2 hpw
Credit points (ECTS credits)	5
Workload in hours: - in class and - self-study (incl. examination preparation)	- 60 - 90
Contents	Plant- microbe associations are introduced with fungi and bacteria of phytopathogenic, symbiotic or endophytic nature. The methods involve basics for the Master thesis in microbiology. Molecular mechanisms of cell biology and basics in communication are given. Phenotypical characterization of transformants and the basics of bioinformatic analyses including gene identification and databank as well as expression analyses are provided.
Learning and qualification objectives	Understanding plant-microbe interactions in nature, Koch's postulates and preparing new subjects with original literature (P). Data analysis and presentation skills (S). Regular participation in the practical course is required to reach the study objectives of the module. The teaching staff will inform about further details at the beginning of the courses.
Admission requirements for the module examination	Seminar talk (passed)
Requirements for the award of credit points (forms of examination, weighting of grades in %)	Protocol to the practical course (100 %)

English translation from the German. The translation is for information only; legally binding is only the German original in its currently applicable version. Effective from October 2018.

Module number	MMB018
Module name	Microbial Metabolism
Module coordinator	N.N.
Admission requirements	1 Basic module
Usability (required for)	Advanced modules, Project and Specialization module
Type of module (compulsory, compulsory elective module)	Compulsory module: Elective
Frequency of offer (module cycle)	Yearly
Duration of module	1 semester
Module composition/ Forms of instruction (lecture, seminar, exercise, practical course)	P 2 hpw, blocked, 2 weeks half-day, S or L 2 hpw
Credit points (ECTS credits)	5
Workload in hours: - in class and - self-study (incl. examination preparation)	- 60 - 90
Contents	Aerobic and anaerobic metabolism, bacteria and fungi, specific strategies for evolutionary adaptation and host interactions
Learning and qualification objectives	A protocol is prepared scientifically discussed (P) and new literature selected and presented (S). Regular participation in the practical course is required to reach the study objectives of the module. The teaching staff will inform about further details at the beginning of the courses.
Admission requirements for the module examination	Prepared subject presentation in P (passed)
Requirements for the award of credit points (forms of examination, weighting of grades in %)	Protocol to the practical course (100 %)

English translation from the German. The translation is for information only; legally binding is only the German original in its currently applicable version. Effective from October 2018.

Module number	MMB019
Module name	Wild card
Module coordinator	Professors of Microbiology
Admission requirements	1 Basic module
Usability (required for)	Advanced modules, Project and Specialization module
Type of module (compulsory, compulsory elective module)	Compulsory module: Elective
Frequency of offer (module cycle)	Yearly
Duration of module	1 semester
Module composition/ Forms of instruction (lecture, seminar, exercise, practical course)	P/S/E/L
Credit points (ECTS credits)	5 or 10
Workload in hours: - in class and - self-study (incl. examination preparation)	- 60/120 - 90/180
Contents	Different events offered for students can be combined with 4 or 8 hpw and after a mandatory consultation heard as an extra module. The subjects must clearly pertain to one topic and complement the microbiological subjects of the master program.
Learning and qualification objectives	To be agreed
Admission requirements for the module examination	To be agreed
Requirements for the award of credit points (forms of examination, weighting of grades in %)	To be agreed (100 %)

English translation from the German. The translation is for information only; legally binding is only the German original in its currently applicable version. Effective from October 2018.

Module number	MMB700
Module name	Specialization module
Module coordinator	Professors of Microbiology
Admission requirements	1 Basic module
Usability (required for)	Advanced modules, Project and Specialization module
Type of module (compulsory, compulsory elective module)	Compulsory module: Elective
Frequency of offer (module cycle)	Yearly
Duration of module	1 semester
Module composition/ Forms of instruction (lecture, seminar, exercise, practical course)	P/S/E/L
Credit points (ECTS credits)	15
Workload in hours: - in class and - self-study (incl. examination preparation)	- 300 - 150
Contents	In the module, a research area is selected and the technical preparation of the Master thesis is performed. The tutorial research work contains elaboration of literature data and experimental lab work on a special topic of microbiology, that is part of the current research work of the institution offering the module. It also includes that the students are learning good scientific practise, critical literature survey, or working legis arte in microbiology. The students repeat the essentials by teaching first semester students under the observation of the course leader in module 001 "Introduction into Microbiology".
Learning and qualification objectives	Microbiology techniques; orientation on research subject. The learned technical skills and scientific practices are applied to a first teaching experience and in a scientific subject. Therefore, teaching first semester students in the first week of studies with a practical course is part of this module. Regular participation in the practical course and the seminar is required to reach the study objectives of the module. The teaching staff will inform about further details at the beginning of the courses.
Admission requirements for the module examination	None
Requirements for the award of credit points (forms of examination, weighting of grades in %)	Outline and time table for Master thesis (passed)

English translation from the German. The translation is for information only; legally binding is only the German original in its currently applicable version. Effective from October 2018.

Module number	MMB800
Module name	Project module
Module coordinator	Professors of Microbiology
Admission requirements	1 Basic module
Usability (required for)	Advanced modules, Project and Specialization module
Type of module (compulsory, compulsory elective module)	Compulsory module: Elective
Frequency of offer (module cycle)	Yearly
Duration of module	1 semester
Module composition/ Forms of instruction (lecture, seminar, exercise, practical course)	P/S/E/L
Credit points (ECTS credits)	15
Workload in hours: - in class and - self-study (incl. examination preparation)	- 300 h - 150 h
Contents	The module serves as preparation for the Master thesis by carrying out research within a current research project. It is expected, that the project module is completed at the institution where the Master thesis is planned.
Learning and qualification objectives	Preparing and independently carrying out research projects; orientation to research topics; integrative sight on microbiological topics. Regular participation in the working group seminar is required to reach the study objectives of the module. The teaching staff will inform about further details at the beginning of the courses.
Admission requirements for the module examination	None
Requirements for the award of credit points (forms of examination, weighting of grades in %)	Scientific presentation (100 %)

English translation from the German. The translation is for information only; legally binding is only the German original in its currently applicable version. Effective from October 2018.

Module number	MMB900
Module name	Master thesis
Module coordinator	Professors of Microbiology
Admission requirements	1 Basic module
Usability (required for)	Advanced modules, Project and Specialization module
Type of module (compulsory, compulsory elective module)	Compulsory module: Elective
Frequency of offer (module cycle)	Yearly
Duration of module	1 semester
Module composition/ Forms of instruction (lecture, seminar, exercise, practical course)	P/S/E/L
Credit points (ECTS credits)	30
Workload in hours: - in class and - self-study (incl. examination preparation)	- 700 h - 200 h
Contents	The Master thesis demonstrates that the student is able to solve a problem in the field of microbiology within 6 months independently with scientific methods. The subject of the Master thesis is supervised by one of the module coordinators and must be cleared with him or her. Great importance is attached to carefully collecting, evaluating and interpreting data. The module trains the independent writing of a scientific paper and leads to self-dependent scientific work.
Learning and qualification objectives	Independent development and evaluation of an experiment as well as writing a scientific paper. Regular participation in the working group seminar is required to reach the study objectives of the module. The teaching staff will inform about further details at the beginning of the courses.
Admission requirements for the module examination	None
Requirements for the award of credit points (forms of examination, weighting of grades in %)	Master thesis (100 %)