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UNIVERSITÄT
TÜBINGEN



Module Handbook
Microbiology and Infection Biology
Master of Science

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FACULTY OF SCIENCE
Department of Biology



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1. Objectives of the Programme

The Master of Science programme in Microbiology and Infection Biology offers advanced, research-oriented education in the life sciences, with a particular focus on the biology of microorganisms and their relevance to health, disease, and biotechnology. The programme provides in-depth knowledge of the diverse life processes of microorganisms. In addition to the genetic, biochemical and bioinformatic study of the metabolic performance of bacteria, it addresses the role of microorganisms in pathogenic processes as well as their importance in biotechnological applications.

The broad scientific training provided by the programme qualifies graduates for a wide range of careers, particularly in research-related positions at universities, research institutes, and biotechnology or pharmaceutical companies. Graduates will also be qualified for positions in clinical and diagnostic laboratories, public health institutions, environmental agencies, and governmental organizations. Possible fields of employment include the research and development of new antimicrobial agents, vaccines and diagnostic methods, microbial biotechnology, quality management, clinical research, infection control, epidemiology, environmental microbiology, food microbiology, and bioinformatics. The interdisciplinary competencies acquired during the programme further prepare graduates for careers in science communication, scientific consulting, technology transfer, regulatory affairs, and science management.

The programme also provides an excellent foundation for an academic career and equips graduates with the qualifications required to pursue a doctoral degree (PhD). Its research-oriented nature prepares students for independent scientific work and enables them to contribute to the advancement of knowledge in microbiology, infection biology, and related disciplines. Graduates will be well prepared to develop and implement their own research projects and to pursue leading roles in academic and industrial research.

Graduates will have a thorough knowledge of theoretical concepts, principles and methods in the life sciences, with a particular focus on microbiology and infection biology. They will be familiar with the current state of research and capable of critically evaluating and advancing it. The in-depth knowledge gained in the field of microbiology and infection biology will enable graduates to develop and implement their own research ideas. They will be able to derive concrete scientific questions from general concepts in the life sciences and subject them to theoretical and practical analysis, testing and interpretation. In this context, they will be capable of assessing the relevance and implications of their professional practice while adhering to ethical principles.

Graduates will be able to present, explain and discuss the results of their research in front of a scientific audiences in English, orally as well as in written form.

Requirements/Application

For admission to the M.Sc. degree in Microbiology and Infection Biology, a B.Sc. degree in biology with a grade of 2.50 or better (German scale equivalent) is required. This degree is

designed to run entirely in English. Students can choose to add German courses to their elective module. Proof of English language proficiency at level B2 and German language proficiency at level A2 of the European Framework of Reference for Languages must be supplied. Further details can be found on the website of the Department of Biology (<https://uni-tuebingen.de/de/437>).

Duration

This degree is designed to be completed in 2 years (4 semesters) and yields 120 ECTS points. The degree must be completed within eight semesters.

2. Curriculum

2.1 Overview by Modules

According to the module overview in the “*Studien- und Prüfungsordnung*”

Module Code	Mandatory / Elective	Module Title	Recommended Semester	CP
MIB-001	M	Fundamentals of Microbiology and Infection Biology	1	12
MIB-002	M	Methods in Microbiology and Infection Biology	1	15
MIB-003	M	Spotlights on Current Research Topics	1	3
MIB-004	M	Advanced Elective Module	2	12
MIB-005	M	Quantitative and Computational Biology	2	6
	E	Interdisciplinary Study Area	2-3	12
MIB-006	M	Scientific Communication	3	6
MIB-007	M	Research Module 1	3	12
MIB-008	M	Research Module 2	3	12
MIB-100	M	Master's Thesis	4	30

2.2 Overview by Study Progress*

Se- mes- ter	CP	Study Area I			Study Area II
1.	30	Fundamentals of Microbiology and Infection Biology (12 CP)	Methods in Microbiology and Infection biology (15 CP)	Spotlight on Current Research Topics (3 CP)	
2.	30	Advanced Elective Module (12 CP)	Quantitative and Computational Biology (6 CP)		Interdisciplinary Study Area (12 CP)
3.	30	Research Module 1 (12 CP)	Research Module 2 (12 CP)	Scientific Communication (6 CP)	
4.	30	Master's Thesis (30 CP)			

3. Studies

Modules

Contents, teaching methods, prerequisites and examination procedure can be found in the module description section of this handbook. One ECTS credit point normally stands for 30 working hours (including preparation, follow-up work and exam preparation). A year of full-time study corresponds to 60 ECTS credits.

Module Organiser

For each module, the module organiser is the contact person for all content-related and organisational questions concerning the module and the examination. The name of the module organiser is to be found in each respective module description. The instructors are responsible for their respective courses within the module.

Module Examinations

Examination form and procedure for each module are laid down by the module organiser and made known to the students at the start of the module. A module examination is not considered as passed until **all** coursework required for the module (e.g. protocols, exams etc.) has been completed successfully. Module examinations may be repeated twice. A module examination and, if necessary, repetitions of examinations take place during the course of each module cycle. When the module examination has been passed, the relevant credits together with the grade achieved are registered to the student on the portal "alma".

Lecture Period and Registration

Information on courses and lecture periods are to be found in the online course catalogue at the Campus portal “alma” of the University of Tübingen. Online registration for the respective courses takes place via “alma” during the registration periods (July/Aug. for the winter semester, Feb./March for the summer semester).

Interdisciplinary Study Area (12 CP)

In this field of study, students can extend their studies in the direction of other disciplines to round off their chosen fields of work. Students can choose any course offered by University of Tübingen. Details on the contents of the courses and modules can be found in the module handbook of the respective degree programme and on “alma”. The grades will not be included in the final grade.

Master’s Degree Thesis

The master’s thesis should show the investigation and presentation of a high-order scientific research question. The master’s thesis can be written in German or English.

Work on the master’s thesis can only start when at least 60 credit points of the master’s degree have been earned and one of the research modules has been completed. For a successfully completed master’s thesis 30 credit points (= 6 months workload) are awarded. The master’s thesis is graded by two evaluators. An official list of possible evaluators can be found at the Biology Examination Office. An instruction on the master’s thesis and further information on procedure can be found on the website of the Biology Examination Office.

Master’s Degree Examination, Calculation of Overall Grade, Certificate

The master’s degree examination is taken during the course of studies and consists of the module examinations totalling 90 credit points and the master’s thesis. The master’s degree must be completed by the end of the ninth semester at the latest. Otherwise the right to take the examination expires.

The overall grade of the master’s degree examination is derived from the average of the module grades and the master’s thesis grade (doubled), weighted by the ECTS credit points. Up to 30 points can be earned over and above the 120 master’s degree credit points but cannot be included in the calculation of the final grade.

About eight weeks after the master’s thesis has been submitted, the master’s degree certificate, with transcription of records, can be collected from the Biology Examination Office.

Studying abroad

We strongly encourage you to study abroad. Please clarify in advance with your coordinator when an exchange programme will fit best into your degree programme. The third semester would be best, but the ideal time also depends on your course selection.

Contact persons

Dean of Academic Affairs: Prof. Dr. Hannes Link

<http://www.biologie.uni-tuebingen.de>

Student Advisory Service Biology: Dr. Matthias Stoll

Advice, approval of study achievements

<https://uni-tuebingen.de/en/16190>

Student Advisory Service Microbiology and Infection Biology: Dr. Lisa Bleul

<https://uni-tuebingen.de/de/258572>Examinations Office Biology

Transcript of records, credits, certificates

<https://uni-tuebingen.de/en/16191>

Student Administration

Enrolment/change of enrollment/leave of absence/tuition fees

<https://uni-tuebingen.de/en/596>

Examination regulations, study plans, module handbooks, FAQ, etc.

<http://www.biologie.uni-tuebingen.de>

Fachschaft Biologie/The Student Council

<https://fsbiotuebingen.de>

Student Counseling Service

General enquiries and advice (e.g. study or learning problems, illnesses, disabilities, etc.)

<https://uni-tuebingen.de/en/632>

Family Office

Questions about family responsibilities during your studies (studying with a child, caring for relatives, etc.)

<https://uni-tuebingen.de/en/39962>

Studying abroad/International Office

<https://uni-tuebingen.de/en/113267>

Student finances/Scholarships

<https://uni-tuebingen.de/en/112254>

Information for graduates, jobs, career, internships

<https://uni-tuebingen.de/en/70750>

3. Module Descriptions

MIB-001	Fundamentals of Microbiology and Infection Biology		Mandatory
CP (ECTS Credits)	12		
Workload - Time in Class - Self-Study	Total Workload: 360 h	Time in Class: 120 h / 8 CH*	Self-Study: 240 h
Duration	One semester		
Frequency	Each winter term		
Language of In- struction	English		
Forms of Teaching and Learning	Lecture, seminar, tutorial		
Content	The module provides a comprehensive introduction to the fundamental principles of microbiology and infection biology. Through lectures and accompanying tutorials, students acquire a broad understanding of the biology, diversity, and interactions of microorganisms in environmental and host-associated systems. Topics covered include bacterial growth and physiology, microbial control, genome organization and gene expression, protein structure and function, metabolism, and the molecular mechanisms underlying microbial adaptation, signaling, evolution, and diversity. The module also addresses bacterial ecology, host–microbe interactions, and the composition and function of the human microbiota, with particular emphasis on mucosal microbiota and its role in immune homeostasis. In the field of infection biology, students gain insight into pathogen–host interactions, microbial virulence mechanisms, immune responses to infection, and current approaches to antimicrobial therapy, including the development and spread of antimicrobial resistance. Following a flipped-classroom approach, students independently explore selected topics based on the lecture content and present and discuss their findings in seminars. This format promotes self-directed learning, scientific communication skills, and the ability to engage with current research questions. The module thereby provides a solid foundation for advanced studies in microbiology, infection biology, and related life science disciplines.		

* CH= credit hours (hours spent in classroom per week)

Objectives	Upon successful completion of the module, students will be able to: • demonstrate a broad understanding of fundamental concepts in microbiology and infection biology; • explain the biological processes underlying microbial growth, adaptation, diversity, and host interactions; • describe key mechanisms of infectious disease development, immune defense, and antimicrobial treatment; • independently work on scientific literature and communicate scientific information in oral presentations and discussions; • apply self-directed learning skills to explore and evaluate research questions in the life sciences. • use scientific terminology in English appropriately in oral and written communication;
Requirements for Obtaining Credit, Grading	Course work: regular attendance of seminars and tutorials, presentation in the seminar Examination: written exam.
Transfer	Other master study programmes of biology or natural sciences
Prerequisites	
Responsible person	Hannes Link

MIB-002	Methods in Microbiology and Infection Biology		Mandatory
CP (ECTS Credits)	15		
Workload - Time in Class - Self-Study	Total Workload: 450 h	Time in Class: 180 h / 12 CH	Self-Study: 270 h
Duration	One semester		
Frequency	Each winter term		
Language of In- struction	English		
Forms of Teaching and Learning	Lecture, exercises, lab practical		
Content	In the lecture, students are introduced to fundamental methods in microbiology, molecular biology, biochemistry, and infection biology. Topics include classical microbiological techniques, genetic engineering methods, sequencing technologies, RNA-based methods, cell culture techniques, infection models, basic diagnostic procedures, and approaches for the detection of antibiotic activity. In addition, students gain an understanding of modern biochemical and biophysical methods for the analysis of protein–protein and protein–DNA interactions, protein purification and characterization, as well as advanced imaging techniques. The accompanying exercises consolidate the theoretical knowledge by focusing on experimental design, data interpretation, troubleshooting, and the identification of potential sources of error. During the laboratory practical, students independently perform selected microbiological, molecular biological, and biochemical methods in accordance with principles of good laboratory practice. Furthermore, students can choose from a range of advanced state-of-the-art methodologies and explore them in small-groups in the respective specialized research groups,		
Objectives	Upon successful completion of the module, students will be able to: • explain the principles, applications, and limitations of fundamental methods in microbiology, molecular biology, biochemistry, and infection biology; • describe the theoretical basis of microbiological, molecular biological, biochemical, and biophysical techniques used in modern life science research; • design experiments and select appropriate methodologies to address specific scientific questions; • identify potential sources of error in experimental procedures and critically evaluate the reliability and limitations of experimental data; • perform selected microbiological, molecular biological, and biochemical techniques independently in accordance with good laboratory practice; • analyze, interpret, and document experimental results using appropriate scientific standards.		

Requirements for Obtaining Credit, Grading	Course work: regular attendance, successful execution of all exercises Examination: written exam
Transfer	Other master study programmes of biology or natural sciences
Prerequisites	none
Responsible person	Christoph Mayer

MIB-003	Spotlight on current research topics		Mandatory
CP (ECTS Credits)	3		
Workload - Time in Class - Self-Study	Total Workload: 90 h	Time in Class: 30h / 2 CH	Self-Study: 60 h
Duration	One semester		
Frequency	Each winter term		
Language of Instruction	English		
Forms of Teaching and Learning	Lecture, seminar		
Content	In the lecture, students gain insight into current research activities and emerging topics in microbiology by learning about the projects and research focus areas of the different microbiology research groups at the University of Tübingen. The accompanying seminar includes either presentations by representatives of start-ups or biotechnology companies or an excursions to research institutions or companies. In addition, students participate in the poster session of the previous students cohort, providing them with an opportunity to engage with ongoing research projects, discuss scientific results, and gain experience in scientific communication. The poster session also fosters interaction and networking between different student cohorts, encouraging the exchange of experiences, ideas, and research interests within the programme.		
Objectives	Upon successful completion of the module, students will be able to: • describe current research topics and methodological approaches in microbiology and infection biology; • discuss the research focus areas of different academic and industrial institutions; • critically evaluate scientific results presented in posters and presentations; • communicate and discuss scientific concepts with researchers and fellow students; • identify potential academic and professional career pathways in microbiology, biotechnology, and related disciplines;		
Requirements for Obtaining Credit, Grading	Course work: regular attendance of all lectures, active participation in the seminar Examination: none		
Transfer	Other master study programmes of biology or natural sciences		
Prerequisites			
Responsible person	Lisa Maier		

MIB-004	Advanced elective module		Mandatory
CP (ECTS Credits)	12		
Workload - Time in Class - Self-Study	Total Workload: 360 h	Time in Class: 120h / 8 CH	Self-Study: 240 h
Duration	One semester		
Frequency	Each semester		
Language of In- struction	English		
Forms of Teaching and Learning	Lecture, practical, seminar, excursion		
Content	Students can choose from a selection of courses in advanced microbiology. Detailed information can be found in the descriptions of the individual courses.		
Objectives	Students acquire theoretical and practical knowledge about various advanced topics in microbiology.		
Requirements for Obtaining Credit, Grading	Course work: depending on the selected courses Examination: none		
Transfer	Other master study programmes of biology or natural sciences		
Prerequisites			
Responsible per- son	Brötz-Oesterhelt		

MIB-005	Quantitative and Computational Biology		Mandatory
CP (ECTS Credits)	6		
Workload - Time in Class - Self-Study	Total Workload: 180 h	Time in Class: 60h / 4 CH	Self-Study: 120 h
Duration	One semester		
Frequency	Each semester		
Language of In-struction	English		
Forms of Teaching and Learning	Lectures, tutorial, practical course		
Content	Courses offered within this module will teach and deepen selected topics from and relevant to the computational life sciences. Individual courses focus on sequence bioinformatics, structural bioinformatics, integrative bioinformatics, systems biology, data handling and analysis, statistics, or other relevant topics in the area of computational biology and bioinformatics. The focus of accompanying tutorials is to learn to implement algorithms of theoretical models and to analyze large life science data sets.		
Objectives	Students acquire theoretical knowledge, algorithmic and practical skills about computational biology concepts and methods that enable them to abstract and to model selected problems in the life science domain and to solve them in a data-driven way. The students are familiar to implement programs or write scripts.		
Requirements for Obtaining Credit, Grading	Course work: regular attendance of all lectures, active participation in the tutorial and practical, depending on the selected courses Examination: written exam		
Transfer	Other master study programmes of biology or natural sciences		
Prerequisites			
Responsible person	Ziemert		

MIB-006	Scientific communication		Mandatory
CP (ECTS Credits)	6		
Workload - Time in Class - Self-Study	Total Workload: 180 h	Time in Class: 60h / 4 CH	Self-Study: 120 h
Duration	One semester		
Frequency	Each winter term		
Language of In-struction	English		
Forms of Teaching and Learning	Lecture, seminar, exercises		
Content	The course aims to strengthen scientific communication skills, with a particular focus on writing skills in preparation for the master's thesis. The structure, content, and style of scientific manuscripts are addressed. Core concepts are taught through a combination of lectures, small-group exercises, and written essays, for which students receive extensive personalized feedback. In the journal club, primary scientific articles are discussed. Another part of the course focuses on the structure and content of scientific posters..		
Objectives	Students understand the scientific language in English and learn to evaluate results presented in publications. Specific key skills that are acquired include recognizing the essential components and writing particularities of each section of a primary research article (abstract, introduction, methods, results, discussion), effectively writing scientific texts (paraphrasing, flow, grammatical specificities, etc.), designing clear and informative figures, appropriately referencing scientific literature (in-text and bibliography), and critically analysing and discussing primary scientific articles in a group setting, as well as designing and presenting scientific posters.		
Requirements for Obtaining Credit, Grading	Course work: regular attendance of all lectures, active participation in the seminar and exercises Examination: written essays		
Transfer	Other master study programmes of biology or natural sciences		
Prerequisites			
Responsible person	Wagner		

MIB-007	Research Module 1		Mandatory
CP (ECTS Credits)	12		
Workload - Time in Class - Self-Study	Total Workload: 360 h	Time in Class: 30h / 2 CH	Self-Study: 330 h (independent lab work)
Duration	One semester		
Frequency	Each semester		
Language of Instruction	English.		
Forms of Teaching and Learning	Lab practical, seminar		
Content	Students learn how to work independently on a scientific project in a working group. The students learn to design, implement and evaluate experiments in preparation for their Master's thesis. The students present the progress and background of their experimental work in a scientific poster.		
Objectives	Students are able to independently develop experimental protocols based on scientific literature, to implement experiments in practice and to critically analyse the results. They can write a scientific protocol and present the results orally.		
Requirements for Obtaining Credit, Grading	Course work: exposé and successful execution of a mini project Examination: poster design and presentation		
Transfer	Other master study programmes of biology or natural sciences		
Prerequisites	Fundamentals of Microbiology and Infection biology, Methods in Microbiology and Infection Biology		
Responsible person	Supervisor of the respective laboratory		

MIB-008	Research Module 2		Mandatory
CP (ECTS Credits)	12		
Workload - Time in Class - Self-Study	Total Workload: 360 h	Time in Class: 30h / 2 CH	Self-Study: 330 h (independent lab work)
Duration	One semester		
Frequency	Each semester		
Language of Instruction	English		
Forms of Teaching and Learning	Lab practical, seminar		
Content	Students learn how to work independently on a scientific project in a working group. The students learn to design, carry out and evaluate experiments as preparation for their master's thesis. Students will prepare a protocol and report on the progress and background of their experimental work in an oral presentation.		
Objectives	Students are able to independently develop experimental protocols on the basis of scientific literature, to implement experiments in practice and to critically analyse the results. They can write a scientific protocol and present the results orally.		
Requirements for Obtaining Credit, Grading	Course work: exposé and successful execution of a mini project Examination: Written or oral exam		
Transfer	Other master study programmes of biology or natural sciences		
Prerequisites	Fundamentals of Microbiology and Infection Biology & Methods in Microbiology and Infection Biology		
Responsible person	Supervisor of the respective laboratory		

MIB-100	Master's Thesis		Mandatory
CP (ECTS Credits)	30		
Workload - Time in Class - Self-Study	Total Workload: 900 h	Time in Class: 30 h / 2 CH	Self-Study: 870 h (independent lab work and writing)
Duration	One semester		
Frequency	Each semester		
Language of In- struction	English		
Forms of Teaching and Learning	Final thesis, progress report		
Content	In the thesis, the students work independently on a research project They acquire new data, exploit and interpret their results, design clear and informative figures and write a clear and concise thesis. The results should contribute to the gain of knowledge of the scientific community. Participation in lab meeting/progress report		
Objectives	The students • can acquaint themselves with complex scientific questions in a given time and are able to make suggestions to solve scientific problems. • they are able to find and apply suitable methods to answer scientific questions • they are able to work in a team in an international scientific environment • they are able to present their results to an international scientific community • they are able to write clear and concise research texts		
Requirements for Obtaining Credit, Grading	Course work: oral presentation of results Examination: written thesis		
Transfer	n.a.		
Prerequisites	Research module 1 or 2		
Responsible per- son	Supervisor of the thesis		