



Module handbook

Cellular and Immunological Biosciences

Master of Science

Valid from Winter Term 2024/25

Faculty of Sciences
Department of Biology
Institute of Cell Biology & Center for Plant Molecular Biology

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Contents

1 Programme overview	3
2 Curriculum	4
2.1 Overview by Modules	4
2.2 Overview by Semesters	5
2.3 Compulsory modules	6
2.3.1 Fundamentals of Cellular and Immunological Biosciences	6
2.3.2 Methods in Cellular and Immunological Biosciences	7
2.3.3 Spotlights on Current Research Topics	8
2.3.4 Advanced Elective Module	9
2.3.5 Quantitative and Computational Biology	10
2.3.6 Scientific Communication	11
2.3.7 Research Module 1	12
2.3.8 Research Module 2	13
2.3.9 Master's thesis	14
2.4 Required elective modules	15
2.5 Interdisciplinary Study Area	15
3 Contact & Information	16

1 Programme overview

The Master of Science degree course in Cellular and Immunological Biosciences -From Single Cells to Plants, Animals, and Humans- is designed to provide instruction and high-level qualifications on the complex regulation of cellular and immunological processes in a variety of organisms ranging from single cells to plants, animals, and humans. The focus of this master's programme is on the in-depth scientific investigation of the molecular mechanisms that regulate the function and behaviour of cells.

Main topics of this study programme include the response of cells to malfunction or pathogen attack and the activation of the different immune systems but also mechanisms that govern developmental processes. A key aspect will be the analyses of model organisms, such as *Saccharomyces*, *Drosophila* or *Arabidopsis* and cell cultures from single plants, animals or human cells. Moreover, besides disease-related malfunctions, as they occur in cases of immunodeficiency or in the context of tumour immunology, comparative aspects of developmental and immunological processes in animals, humans, and plants will be highlighted.

The broad scientific training provided by the study programme will qualify the graduates for a variety of careers, particularly for research-related positions in scientific institutions specialized in molecular biology and immunology. It also provides the prerequisites for a subsequent doctorate.

Admission requirements

For admission to the M.Sc. degree in Cellular and Immunological Biosciences, 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](#).

Successful graduates will:

- have a thorough knowledge of theoretical explanatory approaches, principles and methods in the life sciences, with a focus on cell biology, molecular biology, and immunology.
- be conversant with the current state of research and capable of challenging it. The in-depth knowledge gained in the different research areas enables the graduates to develop their own scientific ideas and projects and find solutions to solve their questions.
- be capable of estimating the relevance and effects of their own professional practice with due regard to ethical principles.
- be able to present, elucidate and discuss the results of their research in front of a scientific audience in English, both orally and in written form.

2 Curriculum

The programme is split into different *Modules* that convey the competences required to successfully complete the programme and enable working in modern research. Some of these modules are *compulsory* while others are *elective*. The topic of the Master thesis is, of course, a free choice¹. Each *Module* has a certain weight given in ECTS that depends on the contact hours and the time spent into individual self-reliant course work. One ECTS credit point equals a workload of about 30 hours (contact hours + self-reliant work + preparations for the exam). Each year of studies usually yields 60 credits. Module details can be found in the electronic course catalogue [ALMA](#).

2.1 Overview by Modules

Module number	Compulsory/ elective	Module name	Recommended semester	CP
CIB-001	c	Fundamentals of Cellular and Immunological Biosciences	1	12
CIB-002	c	Methods in Cellular and Immunological Biosciences	1	15
CIB-003	c	Spotlights on Current Research Topics	1	3
CIB-004	c	Advanced Elective Module	2	12
CIB-005	c	Quantitative and Computational Biology	2	6
CIB-006	c	Scientific Communication	2-3	6
CIB-007	c	Research Module 1	3	12
CIB-008	c	Research Module 2	3	12
	e	Interdisciplinary Study Area	1-3	12
CIB-100	c	Master's thesis	4	30
			total ²	120

¹The topic must be cellular and immunological biology related and at least 60 ECTS must be achieved before candidates can be admitted to the master's thesis

²up to 30 additional credits can be listed in the transcript but will not affect the final grade

2.2 Overview by Semesters

Semester	Total CP	Module number	compulsory elective	Module name	CP
1	30	CIB-001	c	Fundamentals of Cellular and Immunological Biosciences	12
		CIB-002	c	Methods in Cellular and Immunological Biosciences	15
		CIB-003	c	Spotlights on Current Research Topics and/or Interdisciplinary Study Area	3
				Σ	30
2	30	CIB-004	c	Advanced Elective Module	12
		CIB-005	c	Quantitative and Computational Biology	6
		CIB-006	c	Scientific Communication and/or Interdisciplinary Study Area	6
				Σ	60
3	30	CIB-007	c	Research Module 1	12
		CIB-008	c	Research Module 2	12
		CIB-006	c	Scientific Communication and/or Interdisciplinary Study Area	6
				Σ	90
4	30	CIB-100	c	Master's thesis ¹	30
				total ²	120

¹at least 60 ECTS must be achieved before candidates can be admitted to the master thesis

²up to 30 additional credits can be listed in the transcript but will not affect the final grade

2.3 Compulsory modules

2.3.1 Fundamentals of Cellular and Immunological Biosciences

Basic and fundamental knowledge will be taught including genome structure and organization, gene expression, protein structure and function, cell structure and compartmentalization, metabolism, membrane trafficking, communication and signaling, cell growth, division and reproduction, immunity, and infection.

Study aims

Students will

- acquire interdisciplinary basic knowledge in the fields of molecular cell biology and immunology.
- be able to link various specialist areas and paradigms of molecular cell biology and immunology.
- be actively involved in seminars and tutorials and acquire the competence to process information from original publications.

CIB-001	Fundamentals of Cellular and Immunological Biosciences		
Category	compulsory		
ECTS Credits	12		
Workload	360 h	attendance: 120 h (8 credit hours)	private study: 240 h
Duration	1 term		
Cycle of offer	Each winter term		
Language	English		
Format	Lecture, seminar, tutorial		
Requirements	none		
Assessment and grading	Non-assessed coursework: regular attendance, presentation in the seminar Assessment: written exam		
Usability	Master of Science Cellular and Immunological Biosciences		
Module coordination	Proikas-Cezanne, T.		

2.3.2 Methods in Cellular and Immunological Biosciences

- Bioanalytics - Lecture (Lecture 4 SWS): The lecture covers the basics and of methods of cell biology, biochemistry, immunology and molecular biology
- Bioanalytics – Basic Exercises (Exercises 6 SWS): Practical exercises to learn modern basic methods of cell biology, biochemistry, immunology and molecular biology and to apply them to research questions
- Bioanalytics – Advanced Exercises (Exercises 2 SWS): Practical exercises in applying modern advanced methods of cell biology, biochemistry, immunology and molecular biology

Study aims

Students will

- get familiar with important molecular biology, biochemistry and microbiology methods and can conduct them independently while analysing potential errors.
- get familiar with the basics of good scientific work and are able to work in a team.

CIB-002	Methods in Cellular and Immunological Biosciences		
Category	compulsory		
ECTS Credits	15		
Workload	450 h	attendance: 180 h (12 credit hours)	private study: 270 h
Duration	1 term		
Cycle of offer	Each winter term		
Language	English		
Format	Lecture, exercises		
Requirements	none		
Assessment and grading	Non-assessed coursework: regular attendance, successful execution of all exercises Assessment: written exam		
Usability	Master of Science Cellular and Immunological Biosciences		
Module coordination	Stahl, M. El-Kasmi, F.		

2.3.3 Spotlights on Current Research Topics

Introductory lectures on modern molecular biology research fields (2 SWS) - Presentation of topics, specific methods and the respective research field of the various working groups of the participating institutes (ZMBP, IZB). - 2 speakers per lecture/week (max 15 dates). - complemented with a joint full-day seminar and social-activity event at the beginning or end of the semester.

Study aims

Students will

- get to know the different working groups.
- get an insight into the ongoing research.
- get a decision-making support for choosing their elective courses and research modules.
- gain knowledge of the various cellular, molecular, and developmental biological and immunological science projects of the participating institutes.
- start building a network with their peers and the scientists of the participating institutes.

CIB-003	Spotlights on Current Research Topics		
Category	compulsory		
ECTS Credits	3		
Workload	90 h	attendance: 30 h (2 credit hours)	private study: 60 h
Duration	1 term		
Cycle of offer	Each winter term		
Language	English		
Format	Lecture, seminar		
Requirements	none		
Assessment and grading	Non-assessed coursework: regular attendance and active participation Assessment: none		
Usability	Master of Science Cellular and Immunological Biosciences		
Module coordination	Timmermans, M.		

2.3.4 Advanced Elective Module

The students can select two different courses focused on a particular current research topic. These courses will teach advanced concepts and methodology of modern cell biological and immunological research using a combination of either lecture and practical, lecture and seminar or seminar and practical. Courses offered include: Stem Cell Niches of Plants, Principles of Forward Genetics, Comparative Immunity of Plants, Animals, and Bacteria, Cell Biology of Health and Disease, Principles of Immunology, Bacteria-Host-Interactions and others.

Study aims

Students will

- apply and expand their knowledge on state-of-the-art methodology and research question currently pursued.
- strengthen their ability to independently develop research goals, design experiments and postulate hypothesis.
- expand their portfolio of methods and approaches.

CIB-004	Advanced elective module		
Category	compulsory		
ECTS Credits	12		
Workload	360 h	attendance: 120 h (8 credit hours)	private study: 240 h
Duration	1 term		
Cycle of offer	Each term		
Language	English		
Format	Lecture, seminar, practical		
Requirements	none		
Assessment and grading	Non-assessed coursework: regulat attendance and active participation, depending on the selected courses Assessment: none		
Usability	Master of Science Cellular and Molecular Biosciences		
Module coordination	Wolf, S.		

2.3.5 Quantitative and Computational Biology

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.

Study aims

Students will

- 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.
- become familiar with implementing programs or writing scripts.

CIB-005	Quantitative and Computational Biology		
Category	compulsory		
ECTS Credits	6		
Workload	180 h	attendance: 60 h (4 credit hours)	private study: 120 h
Duration	1 term		
Cycle of offer	Each term		
Language	English		
Format	Lecture, tutorial, practical course		
Requirements	none		
Assessment and grading	Non-assessed coursework: regular attendance and active participation, depending on the selected courses Assessment: written exam		
Usability	Master of Science Cellular and Immunological Biosciences		
Module coordination	Harter, K.		

2.3.6 Scientific Communication

Students strengthen their scientific communication skills with a focus on writing skills in preparation for their master's thesis. The structure, content, and style of the scientific manuscripts are addressed. Core concepts are taught using 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.

Study aims

Students will

- understand the scientific language in English and learn to evaluate results presented in publications.
- recognize the essential components and writing particularities of each section of a primary research article (abstract, introduction, methods, results, discussion).
- acquire techniques to write effectively scientific texts, design clear and informative figures, and reference appropriately scientific literature (in-text and bibliography).
- are able to analyse critically and to discuss primary scientific articles in a group setting.

CIB-006	Scientific communication		
Category	compulsory		
ECTS Credits	6		
Workload	180 h	attendance: 60 h (4 credit hours)	private study: 120 h
Duration	1 term		
Cycle of offer	Each term		
Language	English		
Format	Lecture, seminar, excersises		
Requirements	none		
Assessment and grading	Non-assessed coursework: regular attendance of all lectures, active participation in the seminar and excersises Assessment: written essays		
Usability	Master of Science Cellular and Immunological Biosciences		
Module coordination	Coordinator of the programme		

2.3.7 Research Module 1

Through this module, the students will get hands-on experience in current research through the development of a mini project in a laboratory of their choice, putting into practice the theoretical knowledge acquired during other courses in the context of the MSc's programme. The students learn to design and carry out experiments and evaluate the results as preparation for their master's thesis. During this time, they will become full members of the research group and participate in all group activities, e.g. lab meetings.

Study aims

Students will

- learn and apply scientific methodology and acquire experience in experimental design and interpretation, while familiarizing themselves with work in a research laboratory.
- be able to independently develop experimental protocols based on scientific literature, to implement experiments in practice and to critically analyse the results.
- be able to document and present their results.
- exercise their communication skills by preparing and presenting a scientific poster of their results.

CIB-007	Research Module 1		
Category	compulsory		
ECTS Credits	12		
Workload	360 h	attendance: 30 h (2 credit hours)	private study: 330 h (independent lab work)
Duration	1 term		
Cycle of offer	Each term		
Language	English		
Format	Lab practical, seminar		
Requirements	Fundamentals of Cellular and Immunological Biosciences, Methods in Cellular and Immunological Biosciences		
Assessment and grading	<p>Non-assessed coursework: exposé and succesful execution of a mini project</p> <p>Assessment: poster design and presentation</p>		
Usability	Master of Science Cellular and Immunological Biosciences		
Module coordination	Lozano-Durán, R.		

2.3.8 Research Module 2

Through this module, the students will get hands-on experience in current research through the development of a mini project in a laboratory of their choice, putting into practice the theoretical knowledge acquired during other courses in the context of the MSc's programme. The students learn to design and carry out experiments and evaluate the results as preparation for their master's thesis. During this time, they will become full members of the research group and participate in all group activities, e.g. lab meetings.

Study aims

Students will

- learn and apply scientific methodology and acquire experience in experimental design and interpretation, while familiarizing themselves with work in a research laboratory.
- be able to independently develop experimental protocols based on scientific literature, to implement experiments in practice and to critically analyse the results.
- be able to document and present their results.
- exercise their communication skills through a final presentation of their work in form of a scientific talk.

CIB-008	Research Module 2		
Category	compulsory		
ECTS Credits	12		
Workload	360 h	attendance: 30 h (2 credit hours)	private study: 330 h (independent lab work)
Duration	1 term		
Cycle of offer	Each term		
Language	English		
Format	Lab practical, seminar		
Requirements	Fundamentals of Cellular and Immunological Biosciences, Methods in Cellular and Immunological Biosciences		
Assessment and grading	Non-assessed coursework: exposé and successful execution of a mini project Assessment: written or oral exam		
Usability	Master of Science Cellular and Immunological Biosciences		
Module coordination	Lozano-Durán, R.		

2.3.9 Master's thesis

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. Further, students are required to participate in lab meeting/progress report.

Study aims

Within the Master's thesis students will show that they

- 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 and participate in lab meetings/progress report
- they are able to present their results to an international scientific community
- they are able to write clear and concise research texts

CIB-100	Master's thesis		
Category	compulsory		
ECTS Credits	30		
Workload	900 h	attendance: 30 h (2 credit hours)	private study: 870 h (independent lab work and writing)
Duration	1 term		
Cycle of offer	Each term		
Language	English		
Format	Final thesis, progress report		
Requirements	Research Module 1, Research Module 2		
Assessment and grading	Non-assessed coursework: oral presentation of results Assessment: written thesis		
Usability	Master of Science Cellular and Immunological Biosciences		
Module coordination	Supervisor of the thesis		

2.4 Required elective modules

With the *required elective modules* the following general rules apply:

1. Only courses from the course catalogue of the University of Tübingen, or foreign universities in the context of an official semester abroad (e.g. via Erasmus) can be credited.
2. External courses such as internships in external laboratories, companies etc. **can not** be credited.
3. Modules already listed in the B.Sc. transcript **can not** be credited.
4. Up to 30 additional ECTS can be listed in the transcript of records. They will **not** affect the final grade, though.

2.5 Interdisciplinary Study Area (12 ECTS)

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.

3 Contact & Information

General Information about the programme

Website of *Master in Cellular and Immunological Biosciences* programme

Application

Online via the [Alma](#) portal of the Universität. Application deadline: 31st May.

Study coordinator

Dr. Sven Hülsmann, Dr. Farid El-Kasmi

Academic advisory service

Dr. Matthias Stoll, Office of Academic Affairs Biology

Transcript, Certification

Examinations office, Biology

Enrolling/Changing of the subject, granting of a leave

Student administration

Informal information about studying biology, help and hints

Student council of the department of Biology: www.fsbiotuebingen.de