Karlsruher Institut für Technologie

Module Handbook
Biology Master 2014 (Master of Science (M.Sc.))

SPO 2014

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KIT DEPARTMENT OF CHEMISTRY AND BIOSCIENCES

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The Master's Program in Biology at KIT

About KIT

KIT was founded in October 2009 through the merger of the University of Karlsruhe (Campus South) and the Karlsruhe Research Center (Campus North). This unique integration of research and education provides an excellent opportunity for modern and research-oriented teaching in biology. Founded in 1825 as a polytechnic school, KIT is centrally located next to Karlsruhe Palace. The tradition of biology at KIT dates back even further: in 1800, Joseph Gottlieb Kölreuter laid the foundation for plant genetics here.

The City of Karlsruhe

With a population of 300,000, Karlsruhe is one of Germany's smaller major cities but has much to offer:

- With 1,800 hours of sunshine per year, it is one of the warmest cities in Germany.
- A diverse cultural scene, from the Baden State Theatre to the Center for Art and Media (ZKM).
- Large recreational areas, including city forests, numerous green spaces, two botanical gardens, and a zoological garden.

Biology at KIT

The biology program at KIT allows students to engage in cutting-edge international research. Internships are available in areas such as developmental biology, signal transduction, and genome editing. The integration with large-scale research at Campus North also offers additional opportunities in cancer research and interdisciplinary projects.

Objectives of the Master's Program in Biology at KIT

- Professional and interdisciplinary training in all key disciplines of biology
- Research-oriented learning objectives
- Understanding of biological concepts and principles

This program provides students with the opportunity to further specialize in biology according to their interests. Given the vast scope of the field, we believe that students should have the freedom to shape their academic path. Therefore, the program offers a wide range of elective options, allowing students to develop a personalized academic profile.

With so many choices, making a decision can be challenging, but we are here to support and guide you throughout the process.

Our Profile

- Focus on molecular methods and research questions
- Integration with applied research (collaborations with non-university research institutions)
- Interdisciplinary approach (including Chemical Biology, Technical Biology, Geoecology, Toxicology, Food Chemistry, and Materials Science)

Use of Animals in Teaching and Research

Some courses involve the use of animals for teaching and examination purposes, in accordance with § 30a of the LHG. Details are provided in the module descriptions. However, all listed modules are elective, and alternative courses are available. We continuously evaluate alternative teaching methods and materials to reduce and replace the use of animals where possible. If feasible, these alternatives are incorporated into the module descriptions.

Research Modules:

- M-CHEMBIO-100249 Neurodevelopmental Biology
- M-CHEMBIO-100248 Microscopy Techniques
- M-CHEMBIO-100276 Integrated Thinking – Major Excursion to Giglio and Helgoland
- M-CHEMBIO-100251 Methods in Developmental Biology
- M-CHEMBIO-103095 Methods in Developmental Genetics
- M-CHEMBIO-103501 Pathophysiology – Fundamentals of Diseases

Project Modules:

- M-CHEMBIO-100258 Molecular Neurodevelopmental Biology
- M-CHEMBIO-100234 Molecular Cell Biology
- M-CHEMBIO-100265 Methods in Developmental Biology
- M-CHEMBIO-105600 Pathophysiology – Fundamentals of Diseases
- M-CHEMBIO-103942 Molecular Biology of the Cell

Structure of the Master's Program in Biology

In biological research, it is important to stay engaged in experiments over several hours or even multiple consecutive days. Therefore, the Master's program in Biology at KIT is structured in a block format. The semester is divided into three four-week blocks. Additionally, there is another block after the lecture period of the winter and summer semesters and before the lecture period of the winter semester.

At the beginning of the program, you choose three equally weighted subjects. Currently, the following subjects are available: the traditional fields of Botany, Genetics, Microbiology, and Zoology, as well as interdisciplinary fields such as Developmental Biology, Molecular Biology, Cell Biology, and Biochemistry. Additional subjects imported from other degree programs include Chemical Biology, Technical Biology/Biotechnology, Toxicology, and Geoecology. More information can be found on the **program's elective area webpages**.

Within each subject, you typically select two **research modules (F2)**, which are four-week block internships accompanied by a lecture. At the end of a research module, a graded exam is conducted (other type of assessment). A special, interdisciplinary form of the research modules are the major field excursions – for example to Giglio, Helgoland, or the Alps – which take place during the summer semester. The corresponding lecture is offered in the preceding winter semester.
In each of the three subjects, you will also complete a so-called **project module (F3)**. These are also four-week internships in which you work on a small independent research project. The assessment is an ungraded academic requirement, which includes writing a report and usually giving an internal institute presentation and/or documenting the results through status meetings. The project internships are arranged individually with supervisors and are not bound to specific module schedules.

In addition to the internships, you will also complete a total of four seminars:
This includes two **interdisciplinary seminars** (also known as networking seminars). One of these networking seminars can be substituted with a doctoral seminar (covering current topics) or an alternative course at the HOC, the Language Center, or FORUM. You will also take two additional seminars under the title ***"Developing Concepts"***, one on **"Advanced Research Methods"** and one on **"Advanced Presentation Techniques."** In preparation for the Master's thesis, you will also complete the module **Integrated Thinking** – **Planning of Scientific Projects.**

All research and project modules, seminars, and excursions can be freely selected from a predefined catalog, depending on available spots (elective area). This flexibility allows students to tailor their interdisciplinary studies both in terms of content and schedule to fit their personal needs, interests, and career aspirations.
The module handbook provides an overview, with individual courses linked to the course catalog and exam registration system. Additionally, the **central websites for biology education** and the ILIAS learning platform are essential resources. They provide up-to-date information each semester on variable course details (e.g., time and location) and any short-term changes.

Placement for research modules, excursions, and seminars is determined through the **module selection** process, which takes place before each semester (September for the winter semester and March for the summer semester). Therefore, it is important to check your emails regularly at least two months before the semester starts to stay informed about the module selection process.

Qualification Goals of the Master's Program in Biology

The four-semester Master's program in Biology allows students to develop an individual scientific profile in great depth. By combining the conceptual and methodological breadth acquired during their Bachelor's studies with specialization at the Master's level, students gain the academic qualification required for subsequent doctoral studies in the life sciences. Additionally, they expand their ability for interconnected thinking by integrating interdisciplinary elements.

Together with a high level of scientific rigor, independence throughout all phases of the Master's program, experience in an international research environment, and an understanding of complex biological and ecological systems, graduates are well-prepared to take on leadership roles in industrial settings. They will be able to act responsibly, integratively, and sustainably in such positions.

The central qualification goals of the Master's program are:

- Students develop an individual academic profile
- They gain in-depth expertise in selected fields of choice.
- They enhance their scientific independence.
- They practice and internalize scientific methodology.

Individual academic profiling must not become a synonym for narrow specialization. Therefore, the qualification objectives already established in the Bachelor's program – integrative thinking and thinking across different systems and levels of complexity – are further developed and deepened in the Master's program. This is achieved through the key qualification modules (which are designed as interdisciplinary seminars) and the module Integrated Thinking – Planning of Scientific Projects. A key focus at the Master’s level is also the ability to confidently navigate interdisciplinary contexts and to communicate clearly and comprehensibly.

In addition to the previously mentioned objectives, students will also develop the ability to:

- Connect different system and complexity levels.
- Critically read and evaluate scientific literature.
- Deepen their understanding of sustainability and ecological relationships.
- Analyze and interpret complex information, including from interdisciplinary fields, in a targeted and critical manner.
- Clearly and confidently present complex scientific content, including interdisciplinary topics.
- Operate effectively and assertively in an international academic environment.

4 Study Program Structure

Mandatory	
Master's Thesis	30 CP
Required Electives (Election: 3 items)	
Botany	23 CP
Zoology	23 CP
Microbiology	23 CP
Genetics	23 CP
Molecular Biology	23 CP
Cell Biology	23 CP
Developmental Biology	23 CP
Biotechnology	23 CP
Biophysics	23 CP
Biochemistry	23 CP
Technical Biology	23 CP
Toxicology	23 CP
Life Science Engineering	23 CP
Taxonomy and Geoecology	23 CP
Mandatory	
Integrative Biology	21 CP
Voluntary	
Additional Examinations *This field will not influence the calculated grade of its parent.*	

4.1 Master's Thesis

Credits
30

Mandatory				
M-CHEMBIO-100178	Master's Thesis	DE	WS+SS	30 CP

4.2 Botany

Credits
23

Compulsory Elective Subject - Research (Election: 2 items)				
M-CHEMBIO-100191	Research Module: Plant Cell Biology	EN	WS+SS	8 CP
M-CHEMBIO-100192	Research Module: Plant Evolution: Methods and Concepts	EN	WS+SS	8 CP
M-CHEMBIO-100194	Research Module: Seed Technology	DE	SS	8 CP
M-CHEMBIO-100198	Research Module: Plant Gene Technology - Precise Genome Engineering	DE/EN	WS+SS	8 CP
M-CHEMBIO-100200	Research Module: Molecular and Cell Biology of Mycorrhiza	EN	SS	8 CP
M-CHEMBIO-100201	Research Module: Molecular Plant-Microbe Interactions	EN	WS	8 CP
M-CHEMBIO-106694	Research Module: Quantitative Phenotyping in Breeding	DE/EN	SS	8 CP
M-CHEMBIO-106787	Research Module: Resilience - Plants Conquer Land	DE/EN	WS	8 CP
M-CHEMBIO-106908	Research Module: Ecology of City Trees under Global Change	DE/EN	WS	8 CP
M-CHEMBIO-106909	Research Module: Plant Developmental Biology	EN	WS	8 CP
M-CHEMBIO-107557	Research Module: Vegetation and Landscape Development of Baden-Württemberg	DE/EN	Jährlich	8 CP
M-CHEMBIO-107564	Research Module: Alpine Habitats	DE/EN	Jährlich	8 CP
M-CHEMBIO-107565	Research Module: Marine Biology on Heligoland	DE	see notes	8 CP
M-CHEMBIO-107584	Research Module: Marine Biology on Isola del Giglio	DE	see notes	8 CP
M-CHEMBIO-107589	Research Module: Introductory Course on Molecular Methods and Techniques Using Model Organisms (Propaedeutic Module)	EN	WS	8 CP
Compulsory Elective Subject - Project (Election: 1 item)				
M-CHEMBIO-106596	Project Module: Flower Ecology	DE	Irreg.	7 CP
M-CHEMBIO-100202	Project Module: Plant Cell Biology	EN	Irreg.	7 CP
M-CHEMBIO-100203	Project Module: Plant Evolution: Methods and Concepts	EN	Irreg.	7 CP
M-CHEMBIO-100214	Project Module: Plant Molecular Biology	DE/EN	WS+SS	7 CP
M-CHEMBIO-100218	Project Module: Molecular and Cell Biology of Mycorrhiza	EN	Irreg.	7 CP
M-CHEMBIO-100219	Project Module: Molecular Plant-Microbe Interactions	EN	Irreg.	7 CP
M-CHEMBIO-100228	Project Module: Plant Gene Technology - Precise Genome Engineering	DE	Irreg.	7 CP

4.3 Zoology

Credits
23

Compulsory Elective Subject - Research (Election: 2 items)				
M-CHEMBIO-100248	Research Module: Techniques in Microscopy	DE	SS	8 CP
M-CHEMBIO-100249	Research Module: Developmental Neurobiology	DE/EN	WS	8 CP
M-CHEMBIO-100251	Research Module: Methods of Developmental Biology	DE/EN	WS+SS	8 CP
M-CHEMBIO-103501	Research Module: Pathophysiology, Molecular Basis of Diseases	DE/EN	WS+SS	8 CP
M-CHEMBIO-103530	Research Module: Molecular Biology of the Cell	DE/EN	WS	8 CP
M-CHEMBIO-103298	Research Module: Phenomics and Chemomics	EN	SS	8 CP
M-CHEMBIO-103095	Research Module: Methods of Developmental Genetics	EN	WS	8 CP
M-CHEMBIO-105669	Research Module: Epigenetics	EN	Jährlich	8 CP
M-CHEMBIO-105842	Research Module: Chromatin Structures in Cell Division and Development	EN	Jährlich	8 CP
M-CHEMBIO-106907	Research Module: Transcriptomic Analysis	EN	WS	8 CP
M-CHEMBIO-107269	Research Module: Diversity, Systematics and Evolution of Insects	EN	SS	8 CP
M-CHEMBIO-107587	Research Module: Advanced Transcriptomic Analysis	EN	WS	8 CP
M-CHEMBIO-107557	Research Module: Vegetation and Landscape Development of Baden-Württemberg	DE/EN	Jährlich	8 CP
M-CHEMBIO-107564	Research Module: Alpine Habitats	DE/EN	Jährlich	8 CP
M-CHEMBIO-107565	Research Module: Marine Biology on Heligoland	DE	see notes	8 CP
M-CHEMBIO-107584	Research Module: Marine Biology on Isola del Giglio	DE	see notes	8 CP
M-CHEMBIO-107589	Research Module: Introductory Course on Molecular Methods and Techniques Using Model Organisms (Propaedeutic Module)	EN	WS	8 CP
Compulsory Elective Subject - Project (Election: 1 item)				
M-CHEMBIO-100257	Project Module: Advanced Light Microscopy	DE	Irreg.	7 CP
M-CHEMBIO-100258	Project Module: Molecular Developmental Neurobiology	DE	Irreg.	7 CP
M-CHEMBIO-100234	Project Module: Molecular Cell Biology	DE/EN	Irreg.	7 CP
M-CHEMBIO-100265	Project Module: Methods of Developmental Biology	DE/EN	Irreg.	7 CP
M-CHEMBIO-103942	Project Module: Molecular Biology of the Cell	DE/EN	Irreg.	7 CP
M-CHEMBIO-105305	Project Module: Systems Biology & Biophysics	DE	Irreg.	7 CP
M-CHEMBIO-105600	Project Module: Pathophysiology, Molecular Basis of Diseases	DE/EN	Irreg.	7 CP
M-CHEMBIO-105678	Project Module: Epigenetics	EN	WS+SS	7 CP
M-CHEMBIO-106307	Project Module: Chromatin Structures in Cell Division and Development	EN	WS+SS	7 CP
M-CHEMBIO-106854	Project module: Systemic Cellular Neurobiology	EN	WS+SS	7 CP
M-CHEMBIO-106861	Project Module: Biophotonics in Life Sciences	DE/EN	WS+SS	7 CP
M-CHEMBIO-107582	Project Module: Research Based on Scientific Collections at the Natural History Museum	DE/EN	WS+SS	7 CP

4.4 Microbiology

Credits
23

Compulsory Elective Subject - Research (Election: 2 items)				
M-CHEMBIO-100195	Research Module: Photoreceptors in Plants and Microorganisms	DE	WS	8 CP
M-CHEMBIO-100200	Research Module: Molecular and Cell Biology of Mycorrhiza	EN	SS	8 CP
M-CHEMBIO-100201	Research Module: Molecular Plant-Microbe Interactions	EN	WS	8 CP
M-CHEMBIO-100224	Research Module: Genetics of Lower Eukaryotes	DE	SS	8 CP
M-CHEMBIO-100225	Research Module: Microbiology of Eukaryotes	EN	WS	8 CP
M-CHEMBIO-105294	Research Module: Cellular and Medicinal Microbiology	DE	SS	8 CP
M-CHEMBIO-105666	Research Module: From Samples to Sequences	DE/EN	SS	8 CP
M-CHEMBIO-106206	Research Module: Bioinformatics	DE/EN	WS	8 CP
M-CHEMBIO-106787	Research Module: Resilience - Plants Conquer Land	DE/EN	WS	8 CP
M-CHEMBIO-107557	Research Module: Vegetation and Landscape Development of Baden-Württemberg	DE/EN	Jährlich	8 CP
M-CHEMBIO-107564	Research Module: Alpine Habitats	DE/EN	Jährlich	8 CP
M-CHEMBIO-107584	Research Module: Marine Biology on Isola del Giglio	DE	see notes	8 CP
M-CHEMBIO-107589	Research Module: Introductory Course on Molecular Methods and Techniques Using Model Organisms (Propaedeutic Module)	EN	WS	8 CP
Compulsory Elective Subject - Project (Election: 1 item)				
M-CHEMBIO-105603	Project Module:Productive Biofilms	DE	WS+SS	7 CP
M-CHEMBIO-100233	Project Module: Microbiology of Eukaryotes	DE	Irreg.	7 CP
M-CHEMBIO-100218	Project Module: Molecular and Cell Biology of Mycorrhiza	EN	Irreg.	7 CP
M-CHEMBIO-100219	Project Module: Molecular Plant-Microbe Interactions	EN	Irreg.	7 CP
M-CHEMBIO-104785	Project Module: Bacterial Genomic & Computational Biology	DE	WS+SS	7 CP
M-CHEMBIO-105304	Project Module: Cellular and Medicinal Microbiology	DE	Irreg.	7 CP
M-CIWVT-100307	Project Module: Project in Technical Biology	DE	Irreg.	7 CP
M-CHEMBIO-106863	Project Module: Molecular and Cell Biology in Plant/Pathogen Interactions	DE	WS+SS	7 CP
M-CHEMBIO-107084	Project Module: Molecular Mechanism of Bacterial Secretion Systems	DE/EN	WS+SS	7 CP
M-CHEMBIO-107086	Project Module: Application of Bacterial Secretion Systems in Biotechnology, Healthcare and Plant Sciences	DE/EN	WS+SS	7 CP

4.5 Genetics

Credits
23

Compulsory Elective Subject - Research (Election: 2 items)				
M-CHEMBIO-100192	Research Module: Plant Evolution: Methods and Concepts	EN	WS+SS	8 CP
M-CHEMBIO-100194	Research Module: Seed Technology	DE	SS	8 CP
M-CHEMBIO-100198	Research Module: Plant Gene Technology - Precise Genome Engineering	DE/EN	WS+SS	8 CP
M-CHEMBIO-100200	Research Module: Molecular and Cell Biology of Mycorrhiza	EN	SS	8 CP
M-CHEMBIO-100201	Research Module: Molecular Plant-Microbe Interactions	EN	WS	8 CP
M-CHEMBIO-100222	Research Module: Signal Transduction and Gene Regulation I	DE/EN	WS	8 CP
M-CHEMBIO-100223	Research Module: Signal Transduction and Gene Regulation II	EN	SS	8 CP
M-CHEMBIO-100224	Research Module: Genetics of Lower Eukaryotes	DE	SS	8 CP
M-CHEMBIO-100225	Research Module: Microbiology of Eukaryotes	EN	WS	8 CP
M-CHEMBIO-100226	Research Module: Molecular Cell Biology	DE/EN	WS+SS	8 CP
M-CHEMBIO-101596	Research Module: Tissue Engineering and 3D Cell Culture	DE	WS	8 CP
M-CHEMBIO-103095	Research Module: Methods of Developmental Genetics	EN	WS	8 CP
M-CHEMBIO-103298	Research Module: Phenomics and Chemomics	EN	SS	8 CP
M-CHEMBIO-103501	Research Module: Pathophysiology, Molecular Basis of Diseases	DE/EN	WS+SS	8 CP
M-CHEMBIO-105666	Research Module: From Samples to Sequences	DE/EN	SS	8 CP
M-CHEMBIO-105669	Research Module: Epigenetics	EN	Jährlich	8 CP
M-CHEMBIO-105842	Research Module: Chromatin Structures in Cell Division and Development	EN	Jährlich	8 CP
M-CHEMBIO-106206	Research Module: Bioinformatics	DE/EN	WS	8 CP
M-CHEMBIO-106694	Research Module: Quantitative Phenotyping in Breeding	DE/EN	SS	8 CP
M-CHEMBIO-105294	Research Module: Cellular and Medicinal Microbiology	DE	SS	8 CP
M-CHEMBIO-107557	Research Module: Vegetation and Landscape Development of Baden-Württemberg	DE/EN	Jährlich	8 CP
M-CHEMBIO-107564	Research Module: Alpine Habitats	DE/EN	Jährlich	8 CP
M-CHEMBIO-107565	Research Module: Marine Biology on Heligoland	DE	see notes	8 CP
M-CHEMBIO-107584	Research Module: Marine Biology on Isola del Giglio	DE	see notes	8 CP
M-CHEMBIO-107589	Research Module: Introductory Course on Molecular Methods and Techniques Using Model Organisms (Propaedeutic Module)	EN	WS	8 CP
Compulsory Elective Subject - Project (Election: 1 item)				
M-CHEMBIO-100203	Project Module: Plant Evolution: Methods and Concepts	EN	Irreg.	7 CP
M-CHEMBIO-100218	Project Module: Molecular and Cell Biology of Mycorrhiza	EN	Irreg.	7 CP
M-CHEMBIO-100219	Project Module: Molecular Plant-Microbe Interactions	EN	Irreg.	7 CP
M-CHEMBIO-100228	Project Module: Plant Gene Technology - Precise Genome Engineering	DE	Irreg.	7 CP
M-CHEMBIO-100229	Project Module: Signal Transduction in Eukaryotic Systems	DE	Irreg.	7 CP
M-CHEMBIO-100231	Project Module: Molecular Methods in Higher Eukaryotes	DE	WS+SS	7 CP
M-CHEMBIO-100232	Project Module: Genetics of Lower Eukaryotes	DE	Irreg.	7 CP
M-CHEMBIO-100233	Project Module: Microbiology of Eukaryotes	DE	Irreg.	7 CP
M-CHEMBIO-100234	Project Module: Molecular Cell Biology	DE/EN	Irreg.	7 CP
M-CHEMBIO-101597	Project Module: Tissue Engineering and 3D Cell Culture	DE	Irreg.	7 CP
M-CHEMBIO-103096	Project Module: Methods of Developmental Genetics	EN	WS	7 CP
M-CHEMBIO-104785	Project Module: Bacterial Genomic & Computational Biology	DE	WS+SS	7 CP
M-CHEMBIO-105678	Project Module: Epigenetics	EN	WS+SS	7 CP
M-CHEMBIO-105603	Project Module:Productive Biofilms	DE	WS+SS	7 CP
M-CHEMBIO-106307	Project Module: Chromatin Structures in Cell Division and Development	EN	WS+SS	7 CP
M-CHEMBIO-106841	Project Module: Phenomics and Chemomics	DE	WS+SS	7 CP
M-CHEMBIO-106863	Project Module: Molecular and Cell Biology in Plant/Pathogen Interactions	DE	WS+SS	7 CP
M-CHEMBIO-107084	Project Module: Molecular Mechanism of Bacterial Secretion Systems	DE/EN	WS+SS	7 CP
M-CHEMBIO-107086	Project Module: Application of Bacterial Secretion Systems in Biotechnology, Healthcare and Plant Sciences	DE/EN	WS+SS	7 CP

M-CHEMBIO-105305	Project Module: Systems Biology & Biophysics	DE	Irreg.	7 CP

4.6 Molecular Biology

Credits
23

Compulsory Elective Subject - Research (Election: 2 items)				
M-CHEMBIO-100191	Research Module: Plant Cell Biology	EN	WS+SS	8 CP
M-CHEMBIO-100192	Research Module: Plant Evolution: Methods and Concepts	EN	WS+SS	8 CP
M-CHEMBIO-100198	Research Module: Plant Gene Technology - Precise Genome Engineering	DE/EN	WS+SS	8 CP
M-CHEMBIO-100200	Research Module: Molecular and Cell Biology of Mycorrhiza	EN	SS	8 CP
M-CHEMBIO-100201	Research Module: Molecular Plant-Microbe Interactions	EN	WS	8 CP
M-CHEMBIO-100222	Research Module: Signal Transduction and Gene Regulation I	DE/EN	WS	8 CP
M-CHEMBIO-100223	Research Module: Signal Transduction and Gene Regulation II	EN	SS	8 CP
M-CHEMBIO-100267	Research Module: Biomolecular Microanalytics	DE/EN	SS	8 CP
M-CHEMBIO-100224	Research Module: Genetics of Lower Eukaryotes	DE	SS	8 CP
M-CHEMBIO-100225	Research Module: Microbiology of Eukaryotes	EN	WS	8 CP
M-CHEMBIO-100249	Research Module: Developmental Neurobiology	DE/EN	WS	8 CP
M-CHEMBIO-100226	Research Module: Molecular Cell Biology	DE/EN	WS+SS	8 CP
M-CHEMBIO-101596	Research Module: Tissue Engineering and 3D Cell Culture	DE	WS	8 CP
M-CHEMBIO-103095	Research Module: Methods of Developmental Genetics	EN	WS	8 CP
M-CHEMBIO-103501	Research Module: Pathophysiology, Molecular Basis of Diseases	DE/EN	WS+SS	8 CP
M-CHEMBIO-103298	Research Module: Phenomics and Chemomics	EN	SS	8 CP
M-CHEMBIO-103530	Research Module: Molecular Biology of the Cell	DE/EN	WS	8 CP
M-CHEMBIO-105294	Research Module: Cellular and Medicinal Microbiology	DE	SS	8 CP
M-CHEMBIO-105666	Research Module: From Samples to Sequences	DE/EN	SS	8 CP
M-CHEMBIO-105669	Research Module: Epigenetics	EN	Jährlich	8 CP
M-CHEMBIO-105842	Research Module: Chromatin Structures in Cell Division and Development	EN	Jährlich	8 CP
M-CHEMBIO-106206	Research Module: Bioinformatics	DE/EN	WS	8 CP
M-CHEMBIO-106694	Research Module: Quantitative Phenotyping in Breeding	DE/EN	SS	8 CP
M-CHEMBIO-106907	Research Module: Transcriptomic Analysis	EN	WS	8 CP
M-CHEMBIO-106787	Research Module: Resilience - Plants Conquer Land	DE/EN	WS	8 CP
M-CHEMBIO-100194	Research Module: Seed Technology	DE	SS	8 CP
M-CHEMBIO-107587	Research Module: Advanced Transcriptomic Analysis	EN	WS	8 CP
M-CHEMBIO-107557	Research Module: Vegetation and Landscape Development of Baden-Württemberg	DE/EN	Jährlich	8 CP
M-CHEMBIO-107589	Research Module: Introductory Course on Molecular Methods and Techniques Using Model Organisms (Propaedeutic Module)	EN	WS	8 CP
M-CHEMBIO-107584	Research Module: Marine Biology on Isola del Giglio	DE	see notes	8 CP
M-CHEMBIO-107565	Research Module: Marine Biology on Heligoland	DE	see notes	8 CP
M-CHEMBIO-107564	Research Module: Alpine Habitats	DE/EN	Jährlich	8 CP
Compulsory Elective Subject - Project (Election: 1 item)				
M-CHEMBIO-100202	Project Module: Plant Cell Biology	EN	Irreg.	7 CP
M-CHEMBIO-100203	Project Module: Plant Evolution: Methods and Concepts	EN	Irreg.	7 CP
M-CHEMBIO-100214	Project Module: Plant Molecular Biology	DE/EN	WS+SS	7 CP
M-CHEMBIO-100228	Project Module: Plant Gene Technology - Precise Genome Engineering	DE	Irreg.	7 CP
M-CHEMBIO-100218	Project Module: Molecular and Cell Biology of Mycorrhiza	EN	Irreg.	7 CP
M-CHEMBIO-100219	Project Module: Molecular Plant-Microbe Interactions	EN	Irreg.	7 CP
M-CHEMBIO-100268	Project Module: Biomolecular Microanalytics	DE	WS+SS	7 CP
M-CHEMBIO-100229	Project Module: Signal Transduction in Eukaryotic Systems	DE	Irreg.	7 CP
M-CHEMBIO-100231	Project Module: Molecular Methods in Higher Eukaryotes	DE	WS+SS	7 CP
M-CHEMBIO-100232	Project Module: Genetics of Lower Eukaryotes	DE	Irreg.	7 CP
M-CHEMBIO-100233	Project Module: Microbiology of Eukaryotes	DE	Irreg.	7 CP
M-CHEMBIO-100258	Project Module: Molecular Developmental Neurobiology	DE	Irreg.	7 CP
M-CHEMBIO-100234	Project Module: Molecular Cell Biology	DE/EN	Irreg.	7 CP
M-CHEMBIO-105603	Project Module:Productive Biofilms	DE	WS+SS	7 CP

M-CHEMBIO-101597	Project Module: Tissue Engineering and 3D Cell Culture	DE	Irreg.	7 CP
M-CHEMBIO-103096	Project Module: Methods of Developmental Genetics	EN	WS	7 CP
M-CHEMBIO-103942	Project Module: Molecular Biology of the Cell	DE/EN	Irreg.	7 CP
M-CHEMBIO-104785	Project Module: Bacterial Genomic & Computational Biology	DE	WS+SS	7 CP
M-CIWVT-100307	Project Module: Project in Technical Biology	DE	Irreg.	7 CP
M-CHEMBIO-105304	Project Module: Cellular and Medicinal Microbiology	DE	Irreg.	7 CP
M-CHEMBIO-105600	Project Module: Pathophysiology, Molecular Basis of Diseases	DE/EN	Irreg.	7 CP
M-CHEMBIO-105678	Project Module: Epigenetics	EN	WS+SS	7 CP
M-CHEMBIO-106307	Project Module: Chromatin Structures in Cell Division and Development	EN	WS+SS	7 CP
M-CHEMBIO-106854	Project module: Systemic Cellular Neurobiology	EN	WS+SS	7 CP
M-CHEMBIO-106841	Project Module: Phenomics and Chemomics	DE	WS+SS	7 CP
M-CHEMBIO-106862	Project Module: Innovative Microscopy	DE/EN	WS+SS	7 CP
M-CHEMBIO-106863	Project Module: Molecular and Cell Biology in Plant/Pathogen Interactions	DE	WS+SS	7 CP
M-CHEMBIO-107084	Project Module: Molecular Mechanism of Bacterial Secretion Systems	DE/EN	WS+SS	7 CP
M-CHEMBIO-107086	Project Module: Application of Bacterial Secretion Systems in Biotechnology, Healthcare and Plant Sciences	DE/EN	WS+SS	7 CP
M-CHEMBIO-105305	Project Module: Systems Biology & Biophysics	DE	Irreg.	7 CP

4.7 Cell Biology

Credits
23

Compulsory Elective Subject - Research (Election: 2 items)				
M-CHEMBIO-100191	Research Module: Plant Cell Biology	EN	WS+SS	8 CP
M-CHEMBIO-100200	Research Module: Molecular and Cell Biology of Mycorrhiza	EN	SS	8 CP
M-CHEMBIO-100222	Research Module: Signal Transduction and Gene Regulation I	DE/EN	WS	8 CP
M-CHEMBIO-100223	Research Module: Signal Transduction and Gene Regulation II	EN	SS	8 CP
M-CHEMBIO-100225	Research Module: Microbiology of Eukaryotes	EN	WS	8 CP
M-CHEMBIO-100226	Research Module: Molecular Cell Biology	DE/EN	WS+SS	8 CP
M-CHEMBIO-100248	Research Module: Techniques in Microscopy	DE	SS	8 CP
M-CHEMBIO-100249	Research Module: Developmental Neurobiology	DE/EN	WS	8 CP
M-CHEMBIO-101596	Research Module: Tissue Engineering and 3D Cell Culture	DE	WS	8 CP
M-CHEMBIO-103530	Research Module: Molecular Biology of the Cell	DE/EN	WS	8 CP
M-CHEMBIO-103501	Research Module: Pathophysiology, Molecular Basis of Diseases	DE/EN	WS+SS	8 CP
M-CHEMBIO-105294	Research Module: Cellular and Medicinal Microbiology	DE	SS	8 CP
M-CHEMBIO-105669	Research Module: Epigenetics	EN	Jährlich	8 CP
M-CHEMBIO-105842	Research Module: Chromatin Structures in Cell Division and Development	EN	Jährlich	8 CP
M-CHEMBIO-106787	Research Module: Resilience - Plants Conquer Land	DE/EN	WS	8 CP
M-CHEMBIO-106907	Research Module: Transcriptomic Analysis	EN	WS	8 CP
M-CHEMBIO-107587	Research Module: Advanced Transcriptomic Analysis	EN	WS	8 CP
M-CHEMBIO-107564	Research Module: Alpine Habitats	DE/EN	Jährlich	8 CP
M-CHEMBIO-107557	Research Module: Vegetation and Landscape Development of Baden-Württemberg	DE/EN	Jährlich	8 CP
M-CHEMBIO-107565	Research Module: Marine Biology on Heligoland	DE	see notes	8 CP
M-CHEMBIO-107584	Research Module: Marine Biology on Isola del Giglio	DE	see notes	8 CP
M-CHEMBIO-107589	Research Module: Introductory Course on Molecular Methods and Techniques Using Model Organisms (Propaedeutic Module)	EN	WS	8 CP
Compulsory Elective Subject - Project (Election: 1 item)				
M-CHEMBIO-100202	Project Module: Plant Cell Biology	EN	Irreg.	7 CP
M-CHEMBIO-100218	Project Module: Molecular and Cell Biology of Mycorrhiza	EN	Irreg.	7 CP
M-CHEMBIO-100233	Project Module: Microbiology of Eukaryotes	DE	Irreg.	7 CP
M-CHEMBIO-100234	Project Module: Molecular Cell Biology	DE/EN	Irreg.	7 CP
M-CHEMBIO-100257	Project Module: Advanced Light Microscopy	DE	Irreg.	7 CP
M-CHEMBIO-100258	Project Module: Molecular Developmental Neurobiology	DE	Irreg.	7 CP
M-CHEMBIO-101597	Project Module: Tissue Engineering and 3D Cell Culture	DE	Irreg.	7 CP
M-CHEMBIO-103942	Project Module: Molecular Biology of the Cell	DE/EN	Irreg.	7 CP
M-CHEMBIO-105304	Project Module: Cellular and Medicinal Microbiology	DE	Irreg.	7 CP
M-CHEMBIO-105305	Project Module: Systems Biology & Biophysics	DE	Irreg.	7 CP
M-CHEMBIO-105600	Project Module: Pathophysiology, Molecular Basis of Diseases	DE/EN	Irreg.	7 CP
M-CHEMBIO-105678	Project Module: Epigenetics	EN	WS+SS	7 CP
M-CHEMBIO-100219	Project Module: Molecular Plant-Microbe Interactions	EN	Irreg.	7 CP
M-CHEMBIO-106854	Project module: Systemic Cellular Neurobiology	EN	WS+SS	7 CP
M-CHEMBIO-106861	Project Module: Biophotonics in Life Sciences	DE/EN	WS+SS	7 CP
M-CHEMBIO-106862	Project Module: Innovative Microscopy	DE/EN	WS+SS	7 CP
M-CHEMBIO-107084	Project Module: Molecular Mechanism of Bacterial Secretion Systems	DE/EN	WS+SS	7 CP
M-CHEMBIO-107086	Project Module: Application of Bacterial Secretion Systems in Biotechnology, Healthcare and Plant Sciences	DE/EN	WS+SS	7 CP

4.8 Developmental Biology

Credits
23

Compulsory Elective Subject - Research (Election: 2 items)				
M-CHEMBIO-100191	Research Module: Plant Cell Biology	EN	WS+SS	8 CP
M-CHEMBIO-100248	Research Module: Techniques in Microscopy	DE	SS	8 CP
M-CHEMBIO-100249	Research Module: Developmental Neurobiology	DE/EN	WS	8 CP
M-CHEMBIO-103530	Research Module: Molecular Biology of the Cell	DE/EN	WS	8 CP
M-CHEMBIO-100226	Research Module: Molecular Cell Biology	DE/EN	WS+SS	8 CP
M-CHEMBIO-103501	Research Module: Pathophysiology, Molecular Basis of Diseases	DE/EN	WS+SS	8 CP
M-CHEMBIO-100251	Research Module: Methods of Developmental Biology	DE/EN	WS+SS	8 CP
M-CHEMBIO-103095	Research Module: Methods of Developmental Genetics	EN	WS	8 CP
M-CHEMBIO-105842	Research Module: Chromatin Structures in Cell Division and Development	EN	Jährlich	8 CP
M-CHEMBIO-106907	Research Module: Transcriptomic Analysis	EN	WS	8 CP
M-CHEMBIO-106909	Research Module: Plant Developmental Biology	EN	WS	8 CP
M-CHEMBIO-107587	Research Module: Advanced Transcriptomic Analysis	EN	WS	8 CP
M-CHEMBIO-107589	Research Module: Introductory Course on Molecular Methods and Techniques Using Model Organisms (Propaedeutic Module)	EN	WS	8 CP
M-CHEMBIO-107584	Research Module: Marine Biology on Isola del Giglio	DE	see notes	8 CP
M-CHEMBIO-107565	Research Module: Marine Biology on Heligoland	DE	see notes	8 CP
M-CHEMBIO-107564	Research Module: Alpine Habitats	DE/EN	Jährlich	8 CP
M-CHEMBIO-107557	Research Module: Vegetation and Landscape Development of Baden-Württemberg	DE/EN	Jährlich	8 CP
Compulsory Elective Subject - Project (Election: 1 item)				
M-CHEMBIO-100202	Project Module: Plant Cell Biology	EN	Irreg.	7 CP
M-CHEMBIO-100258	Project Module: Molecular Developmental Neurobiology	DE	Irreg.	7 CP
M-CHEMBIO-100234	Project Module: Molecular Cell Biology	DE/EN	Irreg.	7 CP
M-CHEMBIO-100265	Project Module: Methods of Developmental Biology	DE/EN	Irreg.	7 CP
M-CHEMBIO-103942	Project Module: Molecular Biology of the Cell	DE/EN	Irreg.	7 CP
M-CHEMBIO-105600	Project Module: Pathophysiology, Molecular Basis of Diseases	DE/EN	Irreg.	7 CP
M-CHEMBIO-103096	Project Module: Methods of Developmental Genetics	EN	WS	7 CP
M-CHEMBIO-106307	Project Module: Chromatin Structures in Cell Division and Development	EN	WS+SS	7 CP
M-CHEMBIO-106854	Project module: Systemic Cellular Neurobiology	EN	WS+SS	7 CP
M-CHEMBIO-106861	Project Module: Biophotonics in Life Sciences	DE/EN	WS+SS	7 CP
M-CHEMBIO-105305	Project Module: Systems Biology & Biophysics	DE	Irreg.	7 CP

4.9 Biotechnology

Credits
23

Compulsory Elective Subject - Research (Election: 2 items)				
M-CHEMBIO-100192	Research Module: Plant Evolution: Methods and Concepts	EN	WS+SS	8 CP
M-CHEMBIO-100198	Research Module: Plant Gene Technology - Precise Genome Engineering	DE/EN	WS+SS	8 CP
M-CHEMBIO-100267	Research Module: Biomolecular Microanalytics	DE/EN	SS	8 CP
M-CHEMBIO-100200	Research Module: Molecular and Cell Biology of Mycorrhiza	EN	SS	8 CP
M-CHEMBIO-100201	Research Module: Molecular Plant-Microbe Interactions	EN	WS	8 CP
M-CHEMBIO-101596	Research Module: Tissue Engineering and 3D Cell Culture	DE	WS	8 CP
M-CHEMBIO-103298	Research Module: Phenomics and Chemomics	EN	SS	8 CP
M-CHEMBIO-105666	Research Module: From Samples to Sequences	DE/EN	SS	8 CP
M-CHEMBIO-106907	Research Module: Transcriptomic Analysis	EN	WS	8 CP
M-CHEMBIO-106694	Research Module: Quantitative Phenotyping in Breeding	DE/EN	SS	8 CP
M-CHEMBIO-107587	Research Module: Advanced Transcriptomic Analysis	EN	WS	8 CP
M-CHEMBIO-107589	Research Module: Introductory Course on Molecular Methods and Techniques Using Model Organisms (Propaedeutic Module)	EN	WS	8 CP
Compulsory Elective Subject - Project (Election: 1 item)				
M-CHEMBIO-100203	Project Module: Plant Evolution: Methods and Concepts	EN	Irreg.	7 CP
M-CHEMBIO-100228	Project Module: Plant Gene Technology - Precise Genome Engineering	DE	Irreg.	7 CP
M-CHEMBIO-100268	Project Module: Biomolecular Microanalytics	DE	WS+SS	7 CP
M-CHEMBIO-105603	Project Module:Productive Biofilms	DE	WS+SS	7 CP
M-CHEMBIO-100218	Project Module: Molecular and Cell Biology of Mycorrhiza	EN	Irreg.	7 CP
M-CHEMBIO-100219	Project Module: Molecular Plant-Microbe Interactions	EN	Irreg.	7 CP
M-CHEMBIO-101597	Project Module: Tissue Engineering and 3D Cell Culture	DE	Irreg.	7 CP
M-CHEMBIO-104785	Project Module: Bacterial Genomic & Computational Biology	DE	WS+SS	7 CP
M-CHEMBIO-106307	Project Module: Chromatin Structures in Cell Division and Development	EN	WS+SS	7 CP
M-CHEMBIO-106854	Project module: Systemic Cellular Neurobiology	EN	WS+SS	7 CP
M-CHEMBIO-106841	Project Module: Phenomics and Chemomics	DE	WS+SS	7 CP
M-CHEMBIO-106862	Project Module: Innovative Microscopy	DE/EN	WS+SS	7 CP
M-CHEMBIO-107086	Project Module: Application of Bacterial Secretion Systems in Biotechnology, Healthcare and Plant Sciences	DE/EN	WS+SS	7 CP
M-CIWVT-100307	Project Module: Project in Technical Biology	DE	Irreg.	7 CP

4.10 Biophysics

Credits
23

Compulsory Elective Subject - Research (Election: 2 items)				
M-CHEMBIO-100226	Research Module: Molecular Cell Biology	DE/EN	WS+SS	8 CP
M-CHEMBIO-100248	Research Module: Techniques in Microscopy	DE	SS	8 CP
M-CHEMBIO-100249	Research Module: Developmental Neurobiology	DE/EN	WS	8 CP
M-CHEMBIO-103530	Research Module: Molecular Biology of the Cell	DE/EN	WS	8 CP
M-CHEMBIO-107589	Research Module: Introductory Course on Molecular Methods and Techniques Using Model Organisms (Propaedeutic Module)	EN	WS	8 CP
Compulsory Elective Subject - Project (Election: 1 item)				
M-CHEMBIO-100234	Project Module: Molecular Cell Biology	DE/EN	Irreg.	7 CP
M-CHEMBIO-100257	Project Module: Advanced Light Microscopy	DE	Irreg.	7 CP
M-CHEMBIO-100258	Project Module: Molecular Developmental Neurobiology	DE	Irreg.	7 CP
M-CHEMBIO-103942	Project Module: Molecular Biology of the Cell	DE/EN	Irreg.	7 CP
M-CHEMBIO-105305	Project Module: Systems Biology & Biophysics	DE	Irreg.	7 CP
M-CHEMBIO-106862	Project Module: Innovative Microscopy	DE/EN	WS+SS	7 CP

4.11 Biochemistry

Credits
23

Compulsory Elective Subject - Research (Election: 2 items)				
M-CHEMBIO-100267	Research Module: Biomolecular Microanalytics	DE/EN	SS	8 CP
M-CHEMBIO-100269	Research Module: Genetics and Protein Chemistry	DE	SS	8 CP
M-CHEMBIO-100270	Research Module: Protein Isolation and Kinetics	DE	SS	8 CP
M-CHEMBIO-101596	Research Module: Tissue Engineering and 3D Cell Culture	DE	WS	8 CP
M-CHEMBIO-103298	Research Module: Phenomics and Chemomics	EN	SS	8 CP
M-CHEMBIO-107589	Research Module: Introductory Course on Molecular Methods and Techniques Using Model Organisms (Propaedeutic Module)	EN	WS	8 CP
Compulsory Elective Subject - Project (Election: 1 item)				
M-CHEMBIO-100268	Project Module: Biomolecular Microanalytics	DE	WS+SS	7 CP
M-CHEMBIO-100271	Project Module: Structure and Function of Peptides	DE	Irreg.	7 CP
M-CHEMBIO-101597	Project Module: Tissue Engineering and 3D Cell Culture	DE	Irreg.	7 CP
M-CHEMBIO-105305	Project Module: Systems Biology & Biophysics	DE	Irreg.	7 CP
M-CHEMBIO-106854	Project module: Systemic Cellular Neurobiology	EN	WS+SS	7 CP
M-CHEMBIO-106841	Project Module: Phenomics and Chemomics	DE	WS+SS	7 CP

4.12 Technical Biology

Credits
23

Compulsory Elective Subject - Research (Election: 2 items)				
M-CIWVT-106416	Intensification of Bioprocesses	DE	SS	9 CP
M-CHEMBIO-107589	Research Module: Introductory Course on Molecular Methods and Techniques Using Model Organisms (Propaedeutic Module)	EN	WS	8 CP
Compulsory Elective Subject - Project (Election: 1 item)				
M-CIWVT-107275	Project Module: Intensification of Bioprocesses	DE	SS	14 CP

4.13 Toxicology

Credits
23

Mandatory				
M-CHEMBIO-105673	Research and Project Module: Toxicology and Food Toxicology	DE	SS	17 CP
M-CHEMBIO-105674	General and Food Toxicology for Biology Students	DE	SS	6 CP

4.14 Life Science Engineering

Credits
23

Compulsory Elective Subject - Research (Election: 2 items)				
M-CHEMBIO-100191	Research Module: Plant Cell Biology	EN	WS+SS	8 CP
M-CHEMBIO-100198	Research Module: Plant Gene Technology - Precise Genome Engineering	DE/EN	WS+SS	8 CP
M-CHEMBIO-100200	Research Module: Molecular and Cell Biology of Mycorrhiza	EN	SS	8 CP
M-CHEMBIO-100201	Research Module: Molecular Plant-Microbe Interactions	EN	WS	8 CP
M-CHEMBIO-100267	Research Module: Biomolecular Microanalytics	DE/EN	SS	8 CP
M-CHEMBIO-101596	Research Module: Tissue Engineering and 3D Cell Culture	DE	WS	8 CP
M-CHEMBIO-100269	Research Module: Genetics and Protein Chemistry	DE	SS	8 CP
M-CHEMBIO-100270	Research Module: Protein Isolation and Kinetics	DE	SS	8 CP
M-CHEMBIO-100222	Research Module: Signal Transduction and Gene Regulation I	DE/EN	WS	8 CP
M-CHEMBIO-100223	Research Module: Signal Transduction and Gene Regulation II	EN	SS	8 CP
M-CHEMBIO-100224	Research Module: Genetics of Lower Eukaryotes	DE	SS	8 CP
M-CHEMBIO-103298	Research Module: Phenomics and Chemomics	EN	SS	8 CP
M-CHEMBIO-103095	Research Module: Methods of Developmental Genetics	EN	WS	8 CP
M-CHEMBIO-100225	Research Module: Microbiology of Eukaryotes	EN	WS	8 CP
M-CHEMBIO-105294	Research Module: Cellular and Medicinal Microbiology	DE	SS	8 CP
M-CHEMBIO-100249	Research Module: Developmental Neurobiology	DE/EN	WS	8 CP
M-CHEMBIO-103530	Research Module: Molecular Biology of the Cell	DE/EN	WS	8 CP
M-CHEMBIO-100248	Research Module: Techniques in Microscopy	DE	SS	8 CP
M-CHEMBIO-105669	Research Module: Epigenetics	EN	Jährlich	8 CP
M-CHEMBIO-105666	Research Module: From Samples to Sequences	DE/EN	SS	8 CP
M-CHEMBIO-103501	Research Module: Pathophysiology, Molecular Basis of Diseases	DE/EN	WS+SS	8 CP
M-CHEMBIO-105842	Research Module: Chromatin Structures in Cell Division and Development	EN	Jährlich	8 CP
M-CHEMBIO-106787	Research Module: Resilience - Plants Conquer Land	DE/EN	WS	8 CP
M-CHEMBIO-107589	Research Module: Introductory Course on Molecular Methods and Techniques Using Model Organisms (Propaedeutic Module)	EN	WS	8 CP
M-CHEMBIO-100251	Research Module: Methods of Developmental Biology	DE/EN	WS+SS	8 CP
M-CHEMBIO-106206	Research Module: Bioinformatics	DE/EN	WS	8 CP
Compulsory Elective Subject - Project (Election: 1 item)				
M-CHEMBIO-100202	Project Module: Plant Cell Biology	EN	Irreg.	7 CP
M-CHEMBIO-100203	Project Module: Plant Evolution: Methods and Concepts	EN	Irreg.	7 CP
M-CHEMBIO-100214	Project Module: Plant Molecular Biology	DE/EN	WS+SS	7 CP
M-CHEMBIO-100218	Project Module: Molecular and Cell Biology of Mycorrhiza	EN	Irreg.	7 CP
M-CHEMBIO-100219	Project Module: Molecular Plant-Microbe Interactions	EN	Irreg.	7 CP
M-CHEMBIO-100228	Project Module: Plant Gene Technology - Precise Genome Engineering	DE	Irreg.	7 CP
M-CHEMBIO-100211	Project Module: Bioinformatics	DE	Irreg.	7 CP
M-CHEMBIO-100268	Project Module: Biomolecular Microanalytics	DE	WS+SS	7 CP
M-CHEMBIO-101597	Project Module: Tissue Engineering and 3D Cell Culture	DE	Irreg.	7 CP
M-CHEMBIO-100271	Project Module: Structure and Function of Peptides	DE	Irreg.	7 CP
M-CHEMBIO-103096	Project Module: Methods of Developmental Genetics	EN	WS	7 CP
M-CHEMBIO-100231	Project Module: Molecular Methods in Higher Eukaryotes	DE	WS+SS	7 CP
M-CHEMBIO-100232	Project Module: Genetics of Lower Eukaryotes	DE	Irreg.	7 CP
M-CHEMBIO-104785	Project Module: Bacterial Genomic & Computational Biology	DE	WS+SS	7 CP
M-CHEMBIO-100229	Project Module: Signal Transduction in Eukaryotic Systems	DE	Irreg.	7 CP
M-CHEMBIO-100233	Project Module: Microbiology of Eukaryotes	DE	Irreg.	7 CP
M-CHEMBIO-100257	Project Module: Advanced Light Microscopy	DE	Irreg.	7 CP
M-CHEMBIO-100258	Project Module: Molecular Developmental Neurobiology	DE	Irreg.	7 CP
M-CHEMBIO-103942	Project Module: Molecular Biology of the Cell	DE/EN	Irreg.	7 CP
M-CHEMBIO-105678	Project Module: Epigenetics	EN	WS+SS	7 CP
M-CHEMBIO-105305	Project Module: Systems Biology & Biophysics	DE	Irreg.	7 CP

M-CHEMBIO-100265	Project Module: Methods of Developmental Biology	DE/EN	Irreg.	7 CP
M-CHEMBIO-105600	Project Module: Pathophysiology, Molecular Basis of Diseases	DE/EN	Irreg.	7 CP
M-CHEMBIO-106307	Project Module: Chromatin Structures in Cell Division and Development	EN	WS+SS	7 CP
M-CHEMBIO-106841	Project Module: Phenomics and Chemomics	DE	WS+SS	7 CP
M-CHEMBIO-106861	Project Module: Biophotonics in Life Sciences	DE/EN	WS+SS	7 CP
M-CHEMBIO-106862	Project Module: Innovative Microscopy	DE/EN	WS+SS	7 CP
M-CHEMBIO-106863	Project Module: Molecular and Cell Biology in Plant/Pathogen Interactions	DE	WS+SS	7 CP
M-CHEMBIO-107084	Project Module: Molecular Mechanism of Bacterial Secretion Systems	DE/EN	WS+SS	7 CP
M-CHEMBIO-107086	Project Module: Application of Bacterial Secretion Systems in Biotechnology, Healthcare and Plant Sciences	DE/EN	WS+SS	7 CP

4.15 Taxonomy and Geoecology

Credits
23

Taxonomy and Geoecology (Election: 23 credits)				
M-BGU-105575	Ecology	DE	WS+SS	16 CP
M-CHEMBIO-100192	Research Module: Plant Evolution: Methods and Concepts	EN	WS+SS	8 CP
M-CHEMBIO-106596	Project Module: Flower Ecology	DE	Irreg.	7 CP
M-CHEMBIO-100203	Project Module: Plant Evolution: Methods and Concepts	EN	Irreg.	7 CP
M-CHEMBIO-107269	Research Module: Diversity, Systematics and Evolution of Insects	EN	SS	8 CP
M-CHEMBIO-107582	Project Module: Research Based on Scientific Collections at the Natural History Museum	DE/EN	WS+SS	7 CP
M-CHEMBIO-106908	Research Module: Ecology of City Trees under Global Change	DE/EN	WS	8 CP
M-CHEMBIO-107557	Research Module: Vegetation and Landscape Development of Baden-Württemberg	DE/EN	Jährlich	8 CP
M-CHEMBIO-107564	Research Module: Alpine Habitats	DE/EN	Jährlich	8 CP
M-CHEMBIO-107584	Research Module: Marine Biology on Isola del Giglio	DE	see notes	8 CP
M-CHEMBIO-107565	Research Module: Marine Biology on Heligoland	DE	see notes	8 CP

4.16 Integrative Biology

Credits
21

Mandatory				
M-CHEMBIO-100275	Concept Development	DE/EN	WS+SS	6 CP
M-CHEMBIO-107583	Integrated Thinking - Planning of Scientific Project	DE/EN	WS+SS	9 CP
M-CHEMBIO-100277	Interdisciplinary Thinking	DE/EN	WS+SS	6 CP

4.17 Additional Examinations

Additional Examinations (Election: at most 30 credits)				
M-FORUM-106753	Supplementary Studies on Science, Technology and Society	DE	WS+SS	16 CP

Curriculum of Master Biology (Starting in WiSe 2025/2026)

3 subjects, selectable from: Botany, Genetics, Microbiology, Zoology, Developmental Biology, Molecular Biology, Cell Biology, Biophysics, Biochemistry, Biotechnology, Technical Biology, Toxikology, Life Science Engineering, Taxonomy and Geoecology

1st Semester							
Compulsory Elective Area	**Module Name**	**Course**	**Type**	**CP**	**CP**	**Exam**	**Grade**
Subject 1	Research Module 1A (F2)	Concepts for Research Module 1A	V	1	**8**	PA	yes
		Practice in Research Module 1A	P	7			
	Research Module 1B (F2)	Concepts for Research Module 1B	V	1	**8**	PA	yes
		Practice in Research Module 1B	P	7			
	Project Module 1 (F3)	Research Project in Subject 1	P	7	**7**	SL	nein
Integrative Biology	Developing Concepts	Advanced Research Skills	S	3	**6**	PA	yes
		Advanced Presentation Skills	S	3		PA	yes
					29		
2nd Semester							
Compulsory Elective Area	**Module Name**	**Course**	**Type**	**CP**	**CP**	**Exam**	**Grade**
Subject 2	Research Module 2A (F2)	Concepts for Research Module 2A	V	1	**8**	PA	yes
		Practice in Research Module 2A	P	7			
	Research Module 2B (F2)	Concepts for Research Module 2B	V	1	**8**	PA	yes
		Practice in Research Module 2B	P	7			
	Project Module 2 (F3)	Research Project in Subject 2	P	7	**7**	SL	no
Integrative Biology	Interdisciplinary Thinking	Interdisciplinary Seminar A	S/M	3	**6**	SL oral	no
		Interdisciplinary Seminar B*	S/M	3		SL oral	no
					29		
3rd Semester							
Compulsory Elective Area	**Modue Name**	**Course**	**Type**	**CP**	**CP**	**Exam**	**Grade**
Subject 3	Research Module 3A (F2)	Concepts for Research Module 3A	V	1	**8**	PA	yes
		Practice in Research Module 3A	P	7			
	Research Module 3B (F2)	Concepts for Research Module 3B	V	1	**8**	PA	yes
		Practice in Research Module 3B	P	7			
	Project Module 3 (F3)	Research Project in Subject 3	P	7	**7**	SL	no
Integrative Biology	Integrated Thinking - Planning of Scientific Projects	Planning of Scientific Projects	P	9	**9**	PA	yes
					32		
4th Semester							
Compulsory Elective Area	**Module Name**	**Course**	**Type**	**CP**	**CP**	**Exam**	**Grade**
Master's Thesis			A	30	**30**	A	yes
					120		

*Alternatively, freely selectable offerings at the HOC/Language Center/FORUM

V= Lecture; P= Practical; S=Seminar; M= Mentorship; SP= Written Exam; SL= Ungraded Coursework; PA= Other Type of Exam; A= Thesis

The chronological order of the modules can be freely combined and may deviate from the number of semesters stated above

Example Selection as Guidance - Master's in Biology SPO14 (Starting in Winter Semester 25/26)

The order in which the modules are completed does not matter.

3 subjects, selectable from: Botany, Genetics, Microbiology, Zoology, Developmental Biology, Molecular Biology, Cell Biology, Biophysics, Biochemistry, Biotechnology, Technical Biology, Toxicology, Life Science Engineering, Taxonomy and Geoecology. Note: The timing and composition of the modules may vary from semester to semester.

Compulsory elective	Module No./title	Module name	Semester	Block/Time/Info	CP	Exam	Grade
Microbiology	**M3206**	Research Module: Biomolecular Microanalytics	2. SS	1. Block	**8**	PA	yes
	M4202	Research Module: Cellular Microbiology	2. SS	2. Block	**8**	PA	yes
	M4302	Project Module: Cellular Microbiology	2. SS	3. Block	**7**	SL	no
Integrative Biology	**Developing Concepts**	Botanical Seminar 1	1. WS	Presentation techniques	**6**	PA	yes
		Microbiological Seminar	2. SS	Research techniques		PA	yes
				Sum	**29**		
Compulsory elective	**Module No./title**	**Module name**	**Semester**	**Block/Time/Info**	**CP**	**Exam**	**Grade**
Zoology	**M7201**	Research Module: Epigenetics	1. WS	2. Block	**8**	PA	yes
	M5207	Research Module: Neurodevelopmental Biology	3. WS	1. Block	**8**	PA	yes
	M5307	Project Module: Molecular Neurodevelopmental Biology	3. WS	2. Block	**7**	SL	no
Integrative Biology	**Planning of Scientific Projects**	Integrated Thinking - Planning of Scientific Projects	3. WS	Follow-up Block WS	**9**	PA	yes
				Sum	**32**		
Compulsory elective	**Module No./title**	**Module name**	**Semester**	**Block/Time/Info**	**CP**	**Exam**	**Grade**
Botany	**M1211**	Research Module: Alpine Habitat	1. WS, 1. SS	3. Block	**8**	PA	yes
	M2208	Research Module: Molecular Plant-Microbe Interaction	3. WS	3. Block	**8**	PA	yes
	M1301	Project Module: Plant Cell	1. WS	3. Block	**7**	SL	no
Integrative Biology	**Interdisciplinary Thinking**	Interdisciplinary Seminar	2. SS	Cell Biology	**6**	SL oral	no
			3. WS	Molecular Biology		SL oral	no
4. Semester							
Master's Thesis					**30**	A	yes
				Total	**120**		

* alternatively, an elective course offered at the HOC, Language Center, or FORUM

V= Lecture; P= Practical Course; S=Seminar; M= Mentorship; SP= written exam; SL= coursework; PA=examination of another type; A=Thesis

Important Information on Participating in All Types of Assessments

Assessments include written exams, oral exams, other types of examination performances, and coursework. In order to participate, students must register online in the student portal within the deadlines set by the examiners. If participation in a registered assessment becomes impossible, students must withdraw from the respective assessment within the designated deadline. The following must be observed:

Written Examinations:

A failed examination may be re-examined once. If the re-examination is also failed, an oral re-examination will follow. Withdrawals without providing a reason are permitted up until the exam papers are handed out. Withdrawal can be made (1) **via the student portal** (CMS) until 24:00 (midnight) on the day before the exam, or (2) **directly before the exam,** either in person with the examiner or via the student email address (**xxxx@student.kit.edu**). If option (1) and/or (2) are not met, a medical certificate may be required (e.g., in the case of illness of the student, a child under the student's sole care, or a dependent in need of care).

Withdrawal from a scheduled oral re-examination must be **submitted in writing** to the examination board and must be properly substantiated.

Oral Examinations:

A failed oral examination may be re-examined once. Withdrawals without providing a reason must be made at least three working days in advance via the student portal (CAS). If the three-day deadline is not met, the reason must be submitted to the examination board immediately in writing and credibly substantiated. In the case of illness of the student, a child under the student's sole care, or a dependent in need of care, a medical certificate may be required.

Other Types of Examinations:

An examination of another type may only be repeated once. Such examinations can consist of multiple components. The overall grade is calculated based on the performance in each individual component (see modules and partial assessments). If the examination consists of several components, it is considered passed if the **overall grade** is at least "sufficient" (4.0). This means that the examination must be passed as a whole, and not necessarily in each individual component. Withdrawals without providing a reason must be made at least three working days in advance via the student portal (CMS) and by email directly to the examiner. If the three-day deadline is not met, the reason must be submitted to the examination board immediately in writing and credibly substantiated. In cases of illness of the student, a child under their sole care, or a dependent in need of care, a medical certificate may be required.

Coursework:

Coursework may be repeated multiple times. Withdrawals without providing a reason must be made at least three working days in advance via the student portal (CMS) and by email directly to the examiner. If the three-day deadline is not met, the reason must be submitted to the examination board immediately in writing and credibly substantiated. In cases of illness of the student, a child under their sole care, or a dependent in need of care, a medical certificate may be required.

Applies to All Types of Assessments:

If it is not possible to withdraw in due time via the student portal or directly before a written exam with the examiner, withdrawal may be made in justified cases via the student email address (xxxx@student.kit.edu) by contacting the examiner.

If the withdrawal is made directly through the examiner, it is the examiner's responsibility to carry out the deregistration in the student portal (CMS).

Summary:

Types of Assessment	Re-examination	Withdrawal
Written Examination	A written re-examination	Until the exam papers are handed out by the examiner. Online via the student portal until 24:00 (midnight) on the day before the exam.
	Oral re-examination	Withdrawal via the student portal is not possible. A justified withdrawal must be requested through a written application.
Oral Examination	An oral re-examination	At least 3 working days before the exam date via the student portal and by email directly to the examiner.
Other Types of Examination	One re-examination allowed (under the same conditions as the first attempt)	At least 3 working days before the exam date via the student portal and by email directly to the examiner.
Coursework	Until passed	At least 3 working days before the exam date via the student portal and by email directly to the examiner.

8 Modules

M 8.1 Module: Concept Development [M-CHEMBIO-100275]

Coordinators: Prof. Dr. Jörg Kämper
Organisation: KIT Department of Chemistry and Biosciences
Part of: Integrative Biology

Credits	Grading	Recurrence	Duration	Language	Level	Version
6 CP	graded	Each term	1 term	German/English	4	4

Advanced Literature Research (Election: 1 item as well as 3 credits)			
T-CHEMBIO-100503	Botanical Seminar 1 - Techniques of Information Management	3 CP	
T-CHEMBIO-100490	Theory of Science and Ethics - Presentation Skills	3 CP	Nick
T-CHEMBIO-100504	Botanical Seminar 3 - Techniques of Information Management	3 CP	
T-CHEMBIO-100506	Microbiological Seminar 2 - Techniques of Information Management	3 CP	
T-CHEMBIO-100508	Biochemical Seminar 2 - Techniques of Information Management	3 CP	
T-CHEMBIO-100510	Botanical Seminar 4 - Techniques of Information Management	3 CP	
T-CHEMBIO-100514	Seminar Molecular Genetics - Techniques of Information Management	3 CP	
T-CHEMBIO-103071	Signaling in Cancer - Techniques of Information Management	3 CP	
T-CHEMBIO-106145	Seminar Food Chemistry - Techniques of Information Management	3 CP	Hartwig
T-CHEMBIO-113222	Seminar Epigenetics and Genomics - Techniques of Information Management	3 CP	Erhardt, Kämper
T-CHEMBIO-114849	Current Topics Stem Cell Biology: Gene Regulation Programs Driving Stemness and Differentiation - Techniques of Research and Information Management	3 CP	Erhardt, Mayer
T-CHEMBIO-114858	Current topics in Neurogenomics: Dissecting the Central Dogma of Biology within the Neuron - Techniques of Research and Information Management	3 CP	Mayer, Modic
Advanced Presentation Techniques (Election: 1 item as well as 3 credits)			
T-CHEMBIO-100489	Botanical Seminar 1 - Presentation Skills	3 CP	Nick
T-CHEMBIO-100490	Theory of Science and Ethics - Presentation Skills	3 CP	Nick
T-CHEMBIO-100495	Microbiological Seminar - Presentation Skills	3 CP	Diepold, Fischer
T-CHEMBIO-100498	Current Topics in Cellular Neurobiology - Presentation Skills	3 CP	
T-CHEMBIO-100499	Biochemical Seminar 1 - Presentation Skills	3 CP	
T-CHEMBIO-100500	Seminar Replication, Recombination & Reparation - Presentation Skills	3 CP	
T-CHEMBIO-100501	Current Topics in Molecular Genetics - Presentation Skills	3 CP	
T-CHEMBIO-106144	Seminar Food Chemistry - Presentation Skills	3 CP	Hartwig
T-CHEMBIO-105810	Wildcard	3 CP	
T-CHEMBIO-113223	Seminar Epigenetics and Genomics - Advanced Presentation Techniques	3 CP	Erhardt, Kämper
T-CHEMBIO-114330	Current Topics Stem Cell Biology: Gene Regulation Programs Driving Stemness and Differentiation - Presentation Skills	3 CP	Erhardt, Mayer
T-CHEMBIO-114859	Current topics in Neurogenomics: Dissecting the Central Dogma of Biology within the Neuron - Presentation Techniques	3 CP	Mayer, Modic

Assessment
The aim of this course is to enable the students to understand a research field to a level that allows them to present it in a lecture or scientific talk in a professional way. The comprehension of the research field should reach a level that allows the students to ask questions as directory for a theoretical further development of the research field. Besides the oral presentation, the results of the work are supposed to be presented in the form of a written synopsis. Both parts will be used to decide on the final grade.

Prerequisites
none

Competence Goal
The students will gain a deep insight into the current conceptional discussion within two different seminars.
• They learn to develop a question pattern
• They exercise to identify the original literature which is therefore necessary
• They exercise to read the original literature independently and critically questioning
• The learn to develop important concepts
• They learn to present their literature research clearly and distinctly
• They exercise to keep the balance between detail and overview

Content
The students will present in this module current topics of research in the form of scientific talks or lectures. All research topics are represented by two seminars, one in advanced presentation and one in advanced literature research. Another important component of this module is to teach the students to understand a scietific talk in a way that allows to ask specific questions. Thereby, the students are supposed to understand lissening as an active exercise

Module Grade Calculation
The note results from the talk an the following discussion about it: other forms of evalutation (§4 Abs. 2 Nr. 3)

Additional Information
There are two types of seminars - one is **Advanced Presenting** and the other is **Advanced Researching**. You have to complete one seminar of each type. There are different topics in different working groups to choose from, these are selected within the module selection in August and March respectively.

https://www.biologie.kit.edu/248.php

For the seminars a time slot is kept free in the morning from 8:00-10:00 and in the afternoon at 17:15.

Student teachers (Master of Education Biology) may simply choose one of the seminars, the type does not matter.

Workload
for each of the both seminars

Presence time:22 h
preparation and follow-up time:68 h
total workload: 90 h

Recommendations
Informations on:

http://www.biologie.kit.edu/248.php

Teaching and Learning Methods
Criticial reading of current publications in Biology and presenting the contens if it.

Literature
Current journals which are provided from the working group

Base For
The preparation and writing of the master thesis

M 8.2 Module: Ecology [M-BGU-105575]

Coordinators: Prof. Dr. Sebastian Schmidtlein
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Taxonomy and Geoecology

Credits	Grading	Recurrence	Duration	Language	Level	Version
16 CP	graded	Each term	2 terms	German	4	3

Mandatory			
T-BGU-109123	Vegetation Science	3 CP	Schmidtlein
T-BGU-107481	Introduction to R	3 CP	Schmidtlein
T-BGU-112637	Vegetation Survey and Mapping	4 CP	Ewald
T-BGU-102982	Vegetation Ecology	3 CP	Lewerentz, Schmidtlein
T-BGU-112640	Numerical Ecology and Macroecology	3 CP	Schmidtlein

Prerequisites
None

M 8.3 Module: General and Food Toxicology for Biology Students (M8202) [M-CHEMBIO-105674]

Coordinators: Prof. Dr. Andrea Hartwig
PD Dr. Beate Monika Köberle
Organisation: KIT Department of Chemistry and Biosciences
Part of: Toxicology

Credits	Grading	Recurrence	Duration	Language	Level	Version
6 CP	graded	Each summer term	1 term	German	4	1

Mandatory			
T-CHEMBIO-104464	Food Toxicology	6 CP	Hartwig

M 8.4 Module: Integrated Thinking - Planning of Scientific Project [M-CHEMBIO-107583]

Coordinators: Dozentinnen und Dozenten der Biologie
Organisation: KIT Department of Chemistry and Biosciences
Part of: Integrative Biology

Credits	Grading	Recurrence	Duration	Language	Level	Version
9 CP	graded	Each term	1 term	German/English	4	1

Mandatory			
T-CHEMBIO-114856	Planning of Scientific Project	9 CP	Dozentinnen und Dozenten der Biologie

Assessment
Other types of examination

A maximum of 100 points can be achieved. These are made up as follows:

- **Elaborated project plan**, min. 5 - max. 10 pages (without bibliography).
  Contains: Research question, state of research, experimental procedure plan with risk assessment, alternative approaches as well as a concretized expected gain in knowledge, max. 50 points.
- **Final examination,** 45 minutes.
  Oral presentation of the project plan with subsequent discussion, max. 50 points.
  The final discussion is conducted by the first supervisor of the thesis in accordance with the guidelines of the SPO Master and the second examiner of the Master's thesis or an assessor who must have successfully completed at least the Master's examination (doctoral student, postdoc)

Prerequisites
The module is a compulsory examination for Master's students in Biology. It must be successfully completed before the start of the Master's thesis and usually leads directly to the Master's thesis.

The module can be started when all project modules and research modules have been completed (69 CP). Seminars (see subject Integrative Biology: module Interdisciplinary Thinking and module Forming Concepts) must at least be started and must be completed before the start of the Master's thesis. The module, as part of the subject Integrative Biology, is a prerequisite for the Master's thesis in accordance with Study and Examination Regulations §14(1) and is already included in the required 90 CP.

Modeled Prerequisites
The following conditions have to be fulfilled:

1. The following conditions have to be fulfilled:
    1. The module M-CHEMBIO-100275 - Concept Development must have been started.
    2. The module M-CHEMBIO-100277 - Interdisciplinary Thinking must have been started.
2. You need to have earned at least 69 credits in the following fields:
    - Biochemistry
    - Biophysics
    - Biotechnology
    - Botany
    - Developmental Biology
    - Genetics
    - Life Science Engineering
    - Microbiology
    - Molecular Biology
    - Taxonomy and Geoecology
    - Technical Biology
    - Toxicology
    - Toxicology
    - Cell Biology
    - Zoology

Competence Goal

- Students can independently plan and present a time-limited scientific project.
- They can concretize the research question of the thesis, plan the technical implementation and assess the problems and risks of the methodological approaches used.
- Students can discuss the knowledge gained from the results obtained critically and in the context of the current state of research on the topic of the Master's thesis.
- They can conduct a structured literature search on the problem and present the relevance of the literature to the problem, implementation and discussion. They can draw up a structured plan for the experiments with an estimate of the necessary processing time (milestone plan).
- The students can assess the opportunities and risks of their planned work and, in the event of possible difficulties, indicate changes to the plan and alternative solutions.
- They can prepare an exposé for structuring and writing the planned Master's thesis.
- Students can present their scientific project to scientists and engage in a scientific discussion.
- Students know which theoretical and planning requirements are necessary for the practical implementation of such a project.
- Students are familiar with the concepts of good scientific practice and are able to implement and apply them

Content
Development of a project plan with the following content:

- Development of the research question for the planned Master's thesis
- Elaboration of the current state of research
- Preparation of a schedule with risk assessment and development of alternative approaches
- Execution and concretization of the expected knowledge gain

Additional Information
Students choose their working group by contacting the examiners themselves. Requests can be made at any time.
Module duration: 4 weeks.

Workload
270 hours

Teaching and Learning Methods

- Preliminary discussions and exchange with the examiner/supervisor and other members of the working group on the research question, tasks, methods, techniques and relevant specialist literature.
- Deepening the knowledge required for the thesis through self-study. Creation of a reliable project plan by dealing with the subject matter in dialog with the topic creator.
- "Good scientific practice" is taught via an online course offered by the HOC or comparable courses. The course must be passed before the start of the Master's thesis.

The progress of the work is monitored on a weekly basis using a specified milestone plan:

Milestone 1:

- Formulation of the research question/objective of the work
- Compilation of the relevant scientific publications; for each publication, the relevance to the topic should be presented in one (or a few) sentences

Milestone 2:

- Specification of the research question/aim of the work
- Presentation of the current state of research, including the publications

Milestone 3:

- Presentation of an experimental schedule with a list of the methods/techniques used, risk assessment, expected gain in knowledge

The milestones are discussed with the supervisors on fixed dates. The order of the milestones can be changed if necessary (e.g. experimental schedule BEFORE literature research).

Presentation of the project plan for the planned final thesis as part of a final meeting

The presentation for the final meeting should be structured, FOR EXAMPLE into

- Status of the research
- Research question/hypothesis
- Presentation of the planned experiments, methods/techniques used, statistical procedures
- Possible difficulties / termination / change of plan criteria
- Possible gain in knowledge, opportunities / questions for in-depth work

Following the final discussion, the plan presented is critically discussed. In this way, the students can receive information on necessary adjustments, changed questions and other critical points. Questions on associated and fundamental topics can also be asked in the context of the Master's thesis question.

Base For
Master thesis

M 8.5 Module: Intensification of Bioprocesses [M-CIWVT-106416]

Coordinators: Prof. Dr.-Ing. Dirk Holtmann
Organisation: KIT Department of Chemical and Process Engineering
Part of: Technical Biology (Compulsory Elective Subject - Research)

Credits	Grading	Recurrence	Duration	Language	Level	Version
9 CP	graded	Each summer term	1 term	German	4	1

Mandatory			
T-CIWVT-112998	Intensification of Bioprocesses - Written Exam	6 CP	Holtmann
T-CIWVT-112999	Intensivication of Bioprocesses - Lab	3 CP	Holtmann, Neumann

Assessment
The learing control consists of two partial achievements:

- Written examination, duration: 90 minutes
- Laboratory work: Examination of anaother type

Prerequisites
None

Competence Goal
Technical and methodological competencies

Students will be able to:

- explain the concepts of process intensification
- describe different intensified processes quantitatively
- design and evaluate bioprocess engineering processes on the basis of PI
- analyse interdisciplinary problems at the interface of technology and biological systems and develop solutions to problems
- develop processes with optimal productivities using as little energy and raw materials as possible by combining the advantages of individual disciplines

Social and personal competence

The students will be able to:

- analyse the framework conditions for innovative processes and identify the essential aspects
- identify and evaluate (interdisciplinary) process options
- become independently familiar with new topics
- summarize complex scientific processes

Content
Companies in the chemical and biotechnology industries face particular challenges in times of rising raw material costs, increased competition, and shorter product life cycles.

Process-intensified operations offer great potential for resource efficiency by helping to save materials and energy. According to a generally accepted definition, "Process Intensification (PI) is a collection of revolutionary innovative principles (paradigm shifts) for equipment and processes that can lead to significant improvements in process or process chain efficiency, investment and operating costs, quality, waste, process safety (and other aspects)".

In recent years, process intensification methods have been increasingly used in bioprocess engineering (USP and DSP). These methods are the focus of this module. The following topics are covered in the module:

- Definition of PI, distinction between process optimization and PI.
- Examples from chemical engineering
- Intensified bioreactors and reactor selection (e.g., single-use technologies, rotating bed reactors, enzyme membrane reactors, biofilm reactors)
- PI through adapted operating modes (e.g., repeated fed-batch, perfusion, continuous processes, in situ product removal)
- Process intensification through immobilized enzymes and microorganisms
- Integration of chemo- and biocatalysis
- Electro biotechnological processes
- Photo biotechnological processes
- Use of ultrasound and microwaves for bioprocess intensification
- Bioprocesses in alternative reaction media
- Use of extremophilic organisms / unconventional production organisms

In all sub-areas, the focus is on the quantitative description of the intensified processes.

Module Grade Calculation
The module grade is the CP-weighted average of the two partial achievements.

Workload
Lectures and exercises:

- Attendance time: 60 hrs
- Preparation and wrap-up lectures: 80 hrs
- Exam preparation: 40 hrs

Lab course (90 hrs in total)

- Preparation
- Experiments
- Experimental protocols

Recommendations
Fundamentals in bioprocess engineering are required.

Literature

- Frerich J. Keil (2017) Process intensification, doi.org/10.1515/revce-2017-0085
- Andrzej Stankiewicz, Tom van Gerven, Georgios Stefanidis (2019) The Fundamentals of Process Intensification, Wiley-VCH, Weinheim, ISBN: 978-3-527-32783-6
- VDI ZRE Publikationen: Kurzanalyse Nr. 24, Ressourceneffizienz durch Prozessintensivierung
- Burek et al (2022) Process Intensification as Game Changer in Enzyme Catalysis, https://doi.org/10.3389/fctls.2022.858706

Further literature recommendations will be announced.

M 8.6 Module: Interdisciplinary Thinking [M-CHEMBIO-100277]

Coordinators: Prof. Dr. Reinhard Fischer
Organisation: KIT Department of Chemistry and Biosciences
Part of: Integrative Biology

Credits	Grading	Recurrence	Duration	Language	Level	Version
6 CP	pass/fail	Each term	2 terms	German/English	4	3

Election Notes
Please select any placeholder when self-booking key qualifications. The CP will be adjusted automatically.

Interdisciplinary Seminar A (Election: between 1 and 2 items as well as at least 3 credits)			
T-CHEMBIO-100551	Interdisciplinary Seminar Developmental Biology	3 CP	Gradl
T-CHEMBIO-100552	Interdisciplinary Seminar Molecular Biology	3 CP	Kämper
Interdisciplinary Seminar B (Election: at most 2 items as well as at least 3 credits)			
T-CHEMBIO-100554	Current Topics in the Life Science	3 CP	Orian-Rousseau
T-CHEMBIO-111744	ExperiMentoring - The Mentoring-Program	3 CP	Sturm-Richter
T-CHEMBIO-113901	Self Assignment - Interdisciplinary Seminar 1 (ungraded)	1 CP	Weclawski
T-CHEMBIO-111731	Self Assignment - Interdisciplinary Seminar 2 (ungraded)	2 CP	
T-CHEMBIO-113902	Self Assignment - Interdisciplinary Seminar 3 (ungraded)	3 CP	Weclawski

M 8.7 Module: Master's Thesis [M-CHEMBIO-100178]

Coordinators: Prof. Dr. Jörg Kämper
Organisation: KIT Department of Chemistry and Biosciences
Part of: Master's Thesis

Credits	Grading	Recurrence	Duration	Language	Level	Version
30 CP	graded	Each term	1 term	German	4	1

Mandatory			
T-CHEMBIO-100150	Master's Thesis	30 CP	

Assessment
The control of success is the master thesis and a presentation. The presentation is to be made latest 14 days after delivery of the work. The maximum processing time for the module is 6 month. The theme and the task are adapted to the intended extent. The final document of the module is the master thesis. This document has to be created according to strict scientific rules. Important content-related and formal assistance to write the final thesis can be find on the web page of Biology Teaching of the KIT (http://www.biologie.kit.edu/406.php).

Prerequisites
None

Modeled Prerequisites
The following conditions have to be fulfilled:

1. You need to have earned at least 90 credits in the following fields:
   - Biochemistry
   - Biophysics
   - Biotechnology
   - Botany
   - Developmental Biology
   - Genetics
   - Integrative Biology
   - Life Science Engineering
   - Microbiology
   - Molecular Biology
   - Taxonomy and Geoecology
   - Technical Biology
   - Toxicology
   - Toxicology
   - Cell Biology
   - Zoology

Module Grade Calculation
The master thesis is evaluated from at least one university lecturer, a principal scientist in accordance with section 14 subsection 3 no. 1 KITG or a postdoctoral member of the KIT Faculty and one further examiner.
In case of disaccording Evaluations of the two examiners, the audit committee has to fix the mark of the thesis. In addition a further examiner can be ordered. The evaluation has to be made within 6 weeks after the submission date. The presentation is ungraded.

M 8.8 Module: Project Module: Advanced Light Microscopy (M5306) [M-CHEMBIO-100257]

Coordinators: Prof. Dr. Martin Bastmeyer
Organisation: KIT Department of Chemistry and Biosciences
Part of: Zoology (Compulsory Elective Subject - Project)
Cell Biology (Compulsory Elective Subject - Project)
Biophysics (Compulsory Elective Subject - Project)
Life Science Engineering (Compulsory Elective Subject - Project)

Credits	Grading	Recurrence	Duration	Language	Level	Version
7 CP	graded	Irregular	1 term	German	4	1

Mandatory			
T-CHEMBIO-100483	Advanced Light Microscopy (Practical Project)	7 CP	

Prerequisites
none

M 8.9 Module: Project Module: Application of Bacterial Secretion Systems in Biotechnology, Healthcare and Plant Sciences (MPRO3302) [M-CHEMBIO-107086]

Coordinators: Prof. Dr. Andreas Diepold
Organisation: KIT Department of Chemistry and Biosciences
Part of: Genetics (Compulsory Elective Subject - Project)
Microbiology (Compulsory Elective Subject - Project)
Molecular Biology (Compulsory Elective Subject - Project)
Cell Biology (Compulsory Elective Subject - Project)
Biotechnology (Compulsory Elective Subject - Project)
Life Science Engineering (Compulsory Elective Subject - Project)

Credits	Grading	Recurrence	Duration	Language	Level	Version
7 CP	pass/fail	Each term	1 term	German/English	4	1

Mandatory			
T-CHEMBIO-114127	Application of Bacterial Secretion Systems in Biotechnology, Healthcare and Plant Sciences (Project Module)	7 CP	Diepold

Assessment
The project module is not graded. A qualitative assessment of success takes place in the form of a final presentation.

The success of the internship is reviewed through individual status discussions with the students and inspection of the results of the experiments.

Competence Goal

- Carry out an independent research project in close collaboration with the researchers in the working group.
- You will read original scientific literature, evaluate it critically and use it specifically for your project.
- You will learn how to carry out a project successfully by planning the individual work steps systematically and purposefully.
- You will deepen your skills in all areas of scientific work and documentation.
- You will work in an international scientific team and actively exchange ideas with colleagues.
- You will present your experiments and ideas clearly, precisely and at a scientific level.

Content
You will work full-time over a period of 4 weeks in a current research project on the application and use of bacterial secretion systems in biotechnology, medicine or plant biology. This may include the following questions:

- What opportunities for targeted control and use of bacterial secretion systems arise from current research findings?

- How can we efficiently inject proteins and other molecules into plant and animal cells?

- How can this injection be efficiently controlled, e.g. via external signals such as light (use of optogenetics)?

In the project, current research methods from the fields of bacterial genetics, infection experiments and fluorescence microscopy, especially of living cells, and synthetic microbiology will be learned and used.

Additional Information
4 weeks, full day

In each block by arrangement

Workload
Attendance time:
Internship: 90 h

Preparation and follow-up time:
Internship: 120 h

Literature
Lindner, ..., Diepold, LITESEC-T3SS - Light-controlled protein delivery into eukaryotic cells with high spatial and temporal resolution, Nature Communications, doi: 10.1038/s41467-020-16169-w

Bai, ..., Jin, Bacterial type III secretion system as a protein delivery tool for a broad range of biomedical applications, Biotechnol Advanc, doi: 10.1016/j.biotechadv.2018.01.016

Publications of the working group at https://www.iab.kit.edu/angbiol/1277.php

M 8.10 Module: Project Module: Bacterial Genomic & Computational Biology (MPRO-4311) [M-CHEMBIO-104785]

Coordinators: Dr. John Vollmers
Organisation: KIT Department of Chemistry and Biosciences
Part of: Genetics (Compulsory Elective Subject - Project)
Microbiology (Compulsory Elective Subject - Project)
Molecular Biology (Compulsory Elective Subject - Project)
Biotechnology (Compulsory Elective Subject - Project)
Life Science Engineering (Compulsory Elective Subject - Project)

Credits	Grading	Recurrence	Duration	Language	Level	Version
7 CP	pass/fail	Each term	1 term	German	4	1

Mandatory			
T-CHEMBIO-109787	Bacterial Genomic & Computational Biology (Pactical Project)	7 CP	Vollmers

M 8.11 Module: Project Module: Bioinformatics (M1310) [M-CHEMBIO-100211]

Coordinators: Prof. Dr. Anne-Kristin Kaster
Dr. John Vollmers

Organisation: KIT Department of Chemistry and Biosciences

Part of: Life Science Engineering (Compulsory Elective Subject - Project)

Credits	Grading	Recurrence	Duration	Language	Level	Version
7 CP	graded	Irregular	1 term	German	4	1

Mandatory			
T-CHEMBIO-100418	Bioinformatics (Practical Project)	7 CP	

Assessment
The project module is an ungraded coursework

Prerequisites
none

M 8.12 Module: Project Module: Biomolecular Microanalytics (M3306) [M-CHEMBIO-100268]

Coordinators: Prof. Dr. Christof Niemeyer
Dr. Tim Scharnweber

Organisation: KIT Department of Chemistry and Biosciences

Part of: Molecular Biology (Compulsory Elective Subject - Project)
Biochemistry (Compulsory Elective Subject - Project)
Biotechnology (Compulsory Elective Subject - Project)
Life Science Engineering (Compulsory Elective Subject - Project)

Credits	Grading	Recurrence	Duration	Language	Level	Version
7 CP	pass/fail	Each term	1 term	German	4	1

Mandatory			
T-CHEMBIO-100512	Biomolecular Microanalytics (Practical Project)	7 CP	

M 8.13 Module: Project Module: Biophotonics in Life Sciences (MPRO8310) [M-CHEMBIO-106861]

Coordinators: Prof. Dr. Moritz Kreysing
Organisation: KIT Department of Chemistry and Biosciences
Part of: Zoology (Compulsory Elective Subject - Project)
Developmental Biology (Compulsory Elective Subject - Project)
Cell Biology (Compulsory Elective Subject - Project)
Life Science Engineering (Compulsory Elective Subject - Project)

Credits	Grading	Recurrence	Duration	Language	Level	Version
7 CP	pass/fail	Each term	1 term	German/English	4	1

Mandatory			
T-CHEMBIO-113751	Biophotonics in Life Sciences (Practical Project)	7 CP	Kreysing

Assessment
The project module is not graded. A qualitative success control takes place in the form of a protocol. The success of the internship is checked through individual discussions with the students while considering the results of the experiments

Competence Goal

- You will delve into a current scientific issue and acquire basic knowledge in the field of biophotonics and modern microscopy
- You are interested in optical methods and participate in optical micromanipulation experiments
- You will apply microscopic and cell biology techniques or programming techniques (Python)
- You document your results
- You discuss your results with your colleagues and supervisors
- You research literature to solve problems
- You write a protocol that presents your results and methods

Content

- Development of a scientific project together with a doctoral student or postdoc as supervisor
- Teaching and acquisition of quantitative methods in the life sciences
- The project will be selected from the current scientific problems of the working group in order to have a direct impact on the research of your supervisor.
- Developing the necessary theoretical scientific background.
  Planning, execution, documentation of the experiments under supervision and discussion in the working group

Additional Information
Individual appointment

Workload
90 hours attendance and 120 hours preparation and follow-up time

Teaching and Learning Methods
Practical training

Literature
1.) Erben, Elena, et al. “Opto-fluidically multiplexed assembly and micro-robotics.” Light: Science & Applications, vol. 13, Article 59, 2024.
2.) McKinney, Wes. Python for Data Analysis. O’Reilly Media, 2012.
Nelson, Philip. Biological Physics. W. H. Freeman, 2003.

M 8.14 Module: Project Module: Cellular and Medicinal Microbiology (M4305) [M-CHEMBIO-105304]

Coordinators: Prof. Dr. Reinhard Fischer
PD Dr. Markus Schmidt-Heydt

Organisation: KIT Department of Chemistry and Biosciences

Part of: Microbiology (Compulsory Elective Subject - Project)
Molecular Biology (Compulsory Elective Subject - Project)
Cell Biology (Compulsory Elective Subject - Project)

Credits	Grading	Recurrence	Duration	Language	Level	Version
7 CP	graded	Irregular	1 term	German	4	1

Mandatory			
T-CHEMBIO-110792	Cellular and Medicinal Microbiology (Practical Project)	7 CP	Fischer, Schmidt-Heydt

Prerequisites
none

M 8.15 Module: Project Module: Chromatin Structures in Cell Division and Development (M7302) [M-CHEMBIO-106307]

Coordinators: Prof. Dr. Sylvia Erhardt
Organisation: KIT Department of Chemistry and Biosciences
Part of: Genetics (Compulsory Elective Subject - Project)
Zoology (Compulsory Elective Subject - Project)
Developmental Biology (Compulsory Elective Subject - Project)
Molecular Biology (Compulsory Elective Subject - Project)
Biotechnology (Compulsory Elective Subject - Project)
Life Science Engineering (Compulsory Elective Subject - Project)

Credits	Grading	Recurrence	Duration	Language	Level	Version
7 CP	pass/fail	Each term	1 term	English	4	1

Mandatory			
T-CHEMBIO-112786	Chromatin Structures in Cell Division and Development (Practical Project)	7 CP	Erhardt

Assessment

- The project module is an ungraded
- A protocol on the contents of the internship must be prepared
- The qualitative performance review takes place in the form of a presentation.
- During the internship the performance is checked by individual status talks with the students and inspection of the results of their experiments.

Competence Goal
The following learning objectives are to be achieved by the students:

- They will be able to develop their own scientific questions and delve deeper into a topic area.
- They can organize themselves independently, plan experiments and document and interpret them in a scientifically valid manner.
- You will be able to achieve reliable experimental results independently and on your own responsibility.
- They can learn new molecular biology techniques and carry them out and evaluate them.
- They can professionally present their results in the form of a final presentation in English.

Content
At the beginning, the students are introduced to topics of the working group in order to then develop their own scientific question and a time schedule, on the basis of which they subsequently carry out their experiments. They will be supported and accompanied by the course supervisors at all stages and will thus have the opportunity to deepen their knowledge of methods in the field of chromatin biology, genome organization, cell division and development. Students are instructed to always check experiments for validity and to record all experiments and results in a comprehensible and correct manner. At the end of the internship, students present their results in the lab seminar of the working group and receive feedback on their presentation and internship performance. A protocol is to be prepared after completion of the internship.

Workload
Attendance time:

- Internship: 90 h

Preparation and follow-up time:

- Internship: 120 h

M 8.16 Module: Project Module: Epigenetics (M7301) [M-CHEMBIO-105678]

Coordinators: Prof. Dr. Sylvia Erhardt
Organisation: KIT Department of Chemistry and Biosciences
Part of: Genetics (Compulsory Elective Subject - Project)
Zoology (Compulsory Elective Subject - Project)
Molecular Biology (Compulsory Elective Subject - Project)
Cell Biology (Compulsory Elective Subject - Project)
Life Science Engineering (Compulsory Elective Subject - Project)

Credits	Grading	Recurrence	Duration	Language	Level	Version
7 CP	pass/fail	Each term	1 term	English	4	1

Mandatory			
T-CHEMBIO-111333	Epigenetics (Practical Project)	7 CP	Erhardt

Assessment

- The project module is an ungraded course achievement.
- A protocol on the contents of the internship must be prepared.
- The qualitative performance review takes place in the form of a presentation.
- During the internship, the performance is checked by individual status discussions with the students and inspection of the results of their experiments.

Competence Goal
The following learning objectives are to be achieved by the students:

- They will be able to develop their own scientific questions and delve deeper into a topic area.
- They can organize themselves independently, plan series of experiments and document them in a scientifically valid manner.
- They can apply biological methods for the cultivation and analysis of productive biofilms in a goal-oriented manner.
- You will be able to achieve reliable experimental results independently and on your own responsibility.
- They can acquire new analytical methods and carry them out and evaluate them robotically.
- They can present their results professionally in the form of a final presentation.

Content
At the beginning, the students are expected to develop their own scientific question and a time schedule, on the basis of which they will subsequently carry out their experiments. They will be supported, guided and accompanied at all stages by the course supervisors and will thus have the opportunity to deepen their knowledge of methods in the field of epigenetics, epitranscriptomics and chromatin biology. Students will be instructed to always check experiments for validity and to record all experiments and results in a comprehensible and correct way. At the end of the internship, students present their results in the laboratory seminar of the working group and receive feedback on their presentation and internship performance.

Workload
Attendance time:

- Internship: 90 h

Preparation and follow-up time:

- Internship: 120 h

M 8.17 Module: Project Module: Flower Ecology (M1307) [M-CHEMBIO-106596]

Coordinators: Dr. Heiko Hentrich
Prof. Dr. Peter Nick

Organisation: KIT Department of Chemistry and Biosciences

Part of: Botany (Compulsory Elective Subject - Project)
Taxonomy and Geoecology

Credits	Grading	Recurrence	Duration	Language	Level	Version
7 CP	graded	Irregular	1 term	German	4	1

Mandatory			
T-CHEMBIO-113285	Flower Ecology (Practical Project)	7 CP	Hentrich, Nick

Assessment
The project module is not graded. A qualitative performance review takes place in the form of an accepted protocol and a final presentation (30 min).

Prerequisites
none

Competence Goal
They will achieve the following learning objectives:

- They will acquire knowledge of the theoretical basis of flower ecology (evolution of the flower, flower morphology, sexual reproductive systems, attractors, co-evolution between flowers and their pollinators).
- They acquire knowledge to classify the pollinator syndrome of a flower.
- They will be able to create floral formulas and floral diagrams.
- They will be able to carry out a simple floral ecology research work (floral ecology fieldwork techniques: nectar sampling, scent sampling, flower color determination, visualization of UV stains, observation and marking of flower visitors, stigma receptivity determination, reproductive system determination; floral ecology laboratory work techniques: Nectar analysis, scent analysis, Cruden's determination of pollen to ovule ratio, staining of glandular tissue, pollen viability tests, determination of reproductive success).
- You will practice experimental design and independent documentation of experimental data.
- You will learn to present your results in the form of a final presentation.

Content
Floral ecology is concerned with the interactions between flowers, animals and their environment. It is a multidisciplinary research field that combines disciplines such as taxonomy, genetics, (bio)chemistry, physiology, ethology, etc.. Accordingly, the content with which floral ecologists deal is also broadly diversified. These range from environmental protection and biodiversity to food security.

In the first block, the course teaches the theoretical basics of floral ecology and provides an insight into basic methods for conducting research in this field. In the second block, participants conduct an independent research project in which they put the theoretical content from the first block into practice by studying the floral ecology of a plant.

Module Grade Calculation
The module is not graded.

Additional Information
Module rotation: WS theory part in post-block, in SS 2. block

Teaching and Learning Methods
Internship

M 8.18 Module: Project Module: Genetics of Lower Eukaryotes (M4301) [M-CHEMBIO-100232]

Coordinators: Prof. Dr. Jörg Kämper
Organisation: KIT Department of Chemistry and Biosciences
Part of: Genetics (Compulsory Elective Subject - Project)
Molecular Biology (Compulsory Elective Subject - Project)
Life Science Engineering (Compulsory Elective Subject - Project)

Credits	Grading	Recurrence	Duration	Language	Level	Version
7 CP	graded	Irregular	1 term	German	4	1

Mandatory			
T-CHEMBIO-100442	Molecular Genetics of Lower Eukaryotes (Practical Project)	7 CP	

Prerequisites
none

Literature
Praktikum

M 8.19 Module: Project Module: Innovative Microscopy (MPRO8311) [M-CHEMBIO-106862]

Coordinators: Prof. Dr. Moritz Kreysing
Organisation: KIT Department of Chemistry and Biosciences
Part of: Molecular Biology (Compulsory Elective Subject - Project)
Cell Biology (Compulsory Elective Subject - Project)
Biophysics (Compulsory Elective Subject - Project)
Biotechnology (Compulsory Elective Subject - Project)
Life Science Engineering (Compulsory Elective Subject - Project)

Credits	Grading	Recurrence	Duration	Language	Level	Version
7 CP	pass/fail	Each term	1 term	German/English	4	1

Mandatory			
T-CHEMBIO-113752	Innovative Microscopy (Practical Project)	7 CP	Kreysing

Assessment
The project module is not graded. A qualitative success control takes place in the form of a protocol. The success of the internship is checked through individual discussions with the students while considering the results of the experiments.

Competence Goal

- You will delve deeper into a current scientific issue and acquire basic knowledge in the field of quantitative biology and imaging methods of biological samples
- You will apply microscopic and cell biology techniques (e.g. confocal microscopy, FACS, tissue culture, etc.)
- You are interested in data analysis and will expand your knowledge of data processing with Python
- You document your results
- discuss your results with your colleagues and supervisors
- You will research literature to solve problems
  You will write a protocol presenting your results and methods

Content

- Development of a scientific project together with a doctoral student or postdoc as supervisor
- Teaching and acquisition of quantitative methods in the life sciences
- The project will be selected from the current scientific problems of the working group in order to have a direct impact on the research of your supervisor.
- Developing the necessary theoretical scientific background.
- Planning, execution, documentation of the experiments under supervision and discussion in the working group.
  Writing a protocol that meets the formal requirements of a scientific paper

Additional Information
individual appointment

Workload
90 hours attendance and 120 hours preparation and follow-up time

Teaching and Learning Methods
Practical training

Literature
1) Nelson, Philip. Biological Physics. W. H. Freeman, 2003.
2) McKinney, Wes. Python for Data Analysis. O'Reilly Media, 2012.

M 8.20 Module: Project Module: Intensification of Bioprocesses [M-CIWVT-107275]

Coordinators: Dr. Anke Neumann
Organisation: KIT Department of Chemical and Process Engineering
Part of: Technical Biology (Compulsory Elective Subject - Project)

Credits	Grading	Recurrence	Duration	Language	Level	Version
14 CP	graded	Each summer term	1 term	German	4	1

Mandatory			
T-CIWVT-114319	Practical Project Intensification of Bioprocesses	14 CP	Neumann

M 8.21 Module: Project Module: Methods of Developmental Biology (M6302) [M-CHEMBIO-100265]

Coordinators: Dr. habil. Dietmar Gradl
Prof. Dr. Ferdinand le Noble

Organisation: KIT Department of Chemistry and Biosciences

Part of: Zoology (Compulsory Elective Subject - Project)
Developmental Biology (Compulsory Elective Subject - Project)
Life Science Engineering (Compulsory Elective Subject - Project)

Credits	Grading	Recurrence	Duration	Language	Level	Version
7 CP	graded	Irregular	1 term	German/English	4	1

Mandatory			
T-CHEMBIO-100494	Methods of Developmental Biology (Practical Project)	7 CP	

Prerequisites
none

Competence Goal
The practical course is embedded in our actual research.

The topics include (1) migration of neural crest cells (J. Kashef), (2) regulation of signal transduction (from binding of a ligand to its receptor to target gene regulation (D. Gradl) and regulation of vasculogenesis (F. le Noble).

You learn to present your own results in a professional manner.

Content
The focus of the course is on selected aspects of the actual research. An overwiew is found at: http://zebio.zoo.kit.edu/64.php

The methods include the generation of new constructs for injection experiments and the characterization of the phenotypes of injected Xenopus embryos (gain of function and loss of function experiments). For the analysis of signal transduction pathways we will make use of „animal cap explants“, „Keller-explants“ and/or GFP stained transplants. For a more detailed analysis we will make use of Western-Blot, RT-PCR, immuno-fluorescence, in situ hybridisation and reporter gene assays.

Literature
•Scott F. Gilbert, Developmental Biology, 7th ed., Sinauer, 2006

•Lewis Wolpert, Entwicklungsbiologie, Spektrum Verlag, 2007

•http://zebio.zoo.kit.edu/index.php

M 8.22 Module: Project Module: Methods of Developmental Genetics (M3308) [M-CHEMBIO-103096]

Coordinators: Prof. Dr. Lennart Hilbert
Prof.Dr. Uwe Strähle

Organisation: KIT Department of Chemistry and Biosciences

Part of: Genetics (Compulsory Elective Subject - Project)
Developmental Biology (Compulsory Elective Subject - Project)
Molecular Biology (Compulsory Elective Subject - Project)
Life Science Engineering (Compulsory Elective Subject - Project)

Credits	Grading	Recurrence	Duration	Language	Level	Version
7 CP	pass/fail	Each winter term	1 term	English	4	1

Mandatory			
T-CHEMBIO-106140	Methods of Developmental Genetics (Advanced Practical Course)	7 CP	

Prerequisites
None

Competence Goal
They should achieve the following learning objectives

- You will deepen the conceptual discussion for the selected area
- You will read original literature and practise evaluating it critically
- Carry out a research project lasting approximately four weeks
- Practice and deepen all aspects of scientific work and documentation
- You will develop fluency in teamwork and practice organizing yourself
- You will practise presenting clearly, comprehensibly and scientifically
- You will practise being fluent and confident in an international context

Content
In the project module "Methods of Developmental Genetics", they are carrying out work on the investigation of molecular and cellular processes in embryos and larvae of the zebrafish as a developmental biology model. The methods include the observation and analysis of biological processes as well as the use and production of genetically modified fish lines. Molecular biology and light microscopy techniques play a central role in all projects.

Literature
Gilbert Developmental Biology (Tenth edition)

M 8.23 Module: Project Module: Microbiology of Eukaryotes (M4306) [M-CHEMBIO-100233]

Coordinators: Prof. Dr. Reinhard Fischer
Organisation: KIT Department of Chemistry and Biosciences
Part of: Genetics (Compulsory Elective Subject - Project)
Microbiology (Compulsory Elective Subject - Project)
Molecular Biology (Compulsory Elective Subject - Project)
Cell Biology (Compulsory Elective Subject - Project)
Life Science Engineering (Compulsory Elective Subject - Project)

Credits	Grading	Recurrence	Duration	Language	Level	Version
7 CP	graded	Irregular	1 term	German	4	1

Mandatory			
T-CHEMBIO-100443	Microbiology of Eukaryotes (Practical Project)	7 CP	

Prerequisites
none

M 8.24 Module: Project Module: Molecular and Cell Biology in Plant/Pathogen Interactions (MPRO3320) [M-CHEMBIO-106863]

Coordinators: Prof. Dr. Jörg Kämper
Organisation: KIT Department of Chemistry and Biosciences
Part of: Genetics (Compulsory Elective Subject - Project)
Microbiology (Compulsory Elective Subject - Project)
Molecular Biology (Compulsory Elective Subject - Project)
Life Science Engineering (Compulsory Elective Subject - Project)

Credits	Grading	Recurrence	Duration	Language	Level	Version
7 CP	pass/fail	Each term	1 term	German	4	1

Mandatory			
T-CHEMBIO-113753	Molecular and Cell Biology in Plant/Pathogen Interactions (Practical Project)	7 CP	Kämper

M 8.25 Module: Project Module: Molecular and Cell Biology of Mycorrhiza (M2307) [M-CHEMBIO-100218]

Coordinators: Prof. Dr. Natalia Requena Sanchez
Organisation: KIT Department of Chemistry and Biosciences
Part of: Botany (Compulsory Elective Subject - Project)
Genetics (Compulsory Elective Subject - Project)
Microbiology (Compulsory Elective Subject - Project)
Molecular Biology (Compulsory Elective Subject - Project)
Cell Biology (Compulsory Elective Subject - Project)
Biotechnology (Compulsory Elective Subject - Project)
Life Science Engineering (Compulsory Elective Subject - Project)

Credits	Grading	Recurrence	Duration	Language	Level	Version
7 CP	pass/fail	Irregular	1 term	English	4	1

Mandatory			
T-CHEMBIO-100437	Molecular and Cell Biology of Mycorrhiza (Practical Project)	7 CP	

Prerequisites
none

Literature
http://www.iab.kit.edu/heisenberg/Publications.php

M 8.26 Module: Project Module: Molecular Biology of the Cell (M5308) [M-CHEMBIO-103942]

Coordinators: Prof. Dr. Martin Bastmeyer
Organisation: KIT Department of Chemistry and Biosciences
Part of: Zoology (Compulsory Elective Subject - Project)
Developmental Biology (Compulsory Elective Subject - Project)
Molecular Biology (Compulsory Elective Subject - Project)
Cell Biology (Compulsory Elective Subject - Project)
Biophysics (Compulsory Elective Subject - Project)
Life Science Engineering (Compulsory Elective Subject - Project)

Credits	Grading	Recurrence	Duration	Language	Level	Version
7 CP	pass/fail	Irregular	1 term	German/English	4	1

Mandatory			
T-CHEMBIO-108075	Molecular Biology of the Cell (Practical Project)	7 CP	Bastmeyer

M 8.27 Module: Project Module: Molecular Cell Biology (M6301) [M-CHEMBIO-100234]

Coordinators: Dr. habil. Dietmar Gradl
Prof. Dr. Ferdinand le Noble

Organisation: KIT Department of Chemistry and Biosciences

Part of: Genetics (Compulsory Elective Subject - Project)
Zoology (Compulsory Elective Subject - Project)
Developmental Biology (Compulsory Elective Subject - Project)
Molecular Biology (Compulsory Elective Subject - Project)
Cell Biology (Compulsory Elective Subject - Project)
Biophysics (Compulsory Elective Subject - Project)

Credits	Grading	Recurrence	Duration	Language	Level	Version
7 CP	graded	Irregular	1 term	German/English	4	1

Mandatory			
T-CHEMBIO-100444	Molecular Cell Biology (Practical Project)	7 CP	

Prerequisites
none

Competence Goal
The practical course is embedded in our actual research.

The topics include

(1) migration of neural crest cells (J. Kashef),

(2) regulation of signal transduction (from binding of a ligand to its receptor to target gene regulation (D. Gradl) and

(3) regulation of vasculogenesis (F. le Noble).

You learn to present your own results in a professional manner.

Content
The focus of the course is on selected aspects of the actual research. An overwiew is found at: http://zebio.zoo.kit.edu/64.php

The methods include generation of new constructs for transfection- and injection experiments, transfection and analyses of the transfectants via Western-Blot, RT-PCR immunofluorescence staining, reporter gene assays and live-cell imaging.

In some oft he practical courses we will also use tissue explants of Xenopus embryos for live-cell imaging, immunostaining and expression analyses.

M 8.28 Module: Project Module: Molecular Developmental Neurobiology (M5307) [M-CHEMBIO-100258]

Coordinators: Prof. Dr. Martin Bastmeyer
Dr. Joachim Bentrop

Organisation: KIT Department of Chemistry and Biosciences

Part of: Zoology (Compulsory Elective Subject - Project)
Developmental Biology (Compulsory Elective Subject - Project)
Molecular Biology (Compulsory Elective Subject - Project)
Cell Biology (Compulsory Elective Subject - Project)
Biophysics (Compulsory Elective Subject - Project)
Life Science Engineering (Compulsory Elective Subject - Project)

Credits	Grading	Recurrence	Duration	Language	Level	Version
7 CP	graded	Irregular	1 term	German	4	1

Mandatory			
T-CHEMBIO-100484	Molecular Developmental Neurobiology (Practical Project)	7 CP	

Prerequisites
none

M 8.29 Module: Project Module: Molecular Mechanism of Bacterial Secretion Systems (MPRO3301) [M-CHEMBIO-107084]

Coordinators: Prof. Dr. Andreas Diepold
Organisation: KIT Department of Chemistry and Biosciences
Part of: Genetics (Compulsory Elective Subject - Project)
Microbiology (Compulsory Elective Subject - Project)
Molecular Biology (Compulsory Elective Subject - Project)
Cell Biology (Compulsory Elective Subject - Project)
Life Science Engineering (Compulsory Elective Subject - Project)

Credits	Grading	Recurrence	Duration	Language	Level	Version
7 CP	pass/fail	Each term	1 term	German/English	4	2

Mandatory			
T-CHEMBIO-114126	Molecular Mechanism of Bacterial Secretion Systems (Project Module)	7 CP	Diepold

Assessment
The project module is not graded. A qualitative assessment of success takes place in the form of a final presentation.

The success of the internship is reviewed through individual status discussions with the students and inspection of the results of the experiments.

Competence Goal

- Carry out an independent research project in close collaboration with the researchers in the working group.
- You will read original scientific literature, evaluate it critically and use it specifically for your project.
- You will learn how to carry out a project successfully by planning the individual work steps systematically and purposefully.
- You will deepen your skills in all areas of scientific work and documentation.
- You will work in an international scientific team and actively exchange ideas with colleagues.
- You will present your experiments and ideas clearly, precisely and at a scientific level.

Content
You will work full-time over a period of 4 weeks on a current research project to elucidate the molecular function and utilization of bacterial secretion systems. This may include the following questions:

- How do bacterial secretion systems function at the molecular level?
- How do bacteria utilize these secretion systems during infection?
- How is the utilization of secretion systems controlled?
- How can we use this knowledge to prevent disease and target secretion systems?
- In the project, current research methods from the field of bacterial genetics, interaction studies, infection experiments and fluorescence microscopy, especially on living cells, will be learned and applied.

Additional Information
4 weeks, full day

In each block by arrangement

Workload
Attendance time:
Internship: 90 h

Preparation and follow-up time:
Internship: 120 h

Literature
Costa et al, Secretion systems in Gram-negative bacteria: structural and mechanistic insights, Nat Rev Microbiol, doi: 10.1038/nrmicro3456
Publications of the working group at https://www.iab.kit.edu/angbiol/1277.php

M 8.30 Module: Project Module: Molecular Methods in Higher Eukaryotes (M3311) [M-CHEMBIO-100231]

Coordinators: Prof. Dr. Ute Schepers
Organisation: KIT Department of Chemistry and Biosciences
Part of: Genetics (Compulsory Elective Subject - Project)
Molecular Biology (Compulsory Elective Subject - Project)
Life Science Engineering (Compulsory Elective Subject - Project)

Credits	Grading	Recurrence	Duration	Language	Level	Version
7 CP	graded	Each term	1 term	German	4	1

Mandatory			
T-CHEMBIO-100441	Molecular Methods in Higher Eukaryotes (Practical Project)	7 CP	

M 8.31 Module: Project Module: Molecular Plant-Microbe Interactions (M2307) [M-CHEMBIO-100219]

Coordinators: Prof. Dr. Natalia Requena Sanchez
Organisation: KIT Department of Chemistry and Biosciences
Part of: Botany (Compulsory Elective Subject - Project)
Genetics (Compulsory Elective Subject - Project)
Microbiology (Compulsory Elective Subject - Project)
Molecular Biology (Compulsory Elective Subject - Project)
Cell Biology (Compulsory Elective Subject - Project)
Biotechnology (Compulsory Elective Subject - Project)
Life Science Engineering (Compulsory Elective Subject - Project)

Credits	Grading	Recurrence	Duration	Language	Level	Version
7 CP	pass/fail	Irregular	1 term	English	4	1

Mandatory			
T-CHEMBIO-100438	Molecular Plant-Microbe Interactions (Practical Project)	7 CP	

Assessment
This module is not graded. A short presentation about the conducted research will be used as a qualitative tool for the evaluation of successful participation.

Prerequisites
none

Literature
http://www.iab.kit.edu/heisenberg/Publications.php

M 8.32 Module: Project Module: Pathophysiology, Molecular Basis of Diseases (M6305) [M-CHEMBIO-105600]

Coordinators: Dr. habil. Dietmar Gradl
Prof. Dr. Ferdinand le Noble

Organisation: KIT Department of Chemistry and Biosciences

Part of: Zoology (Compulsory Elective Subject - Project)
Developmental Biology (Compulsory Elective Subject - Project)
Molecular Biology (Compulsory Elective Subject - Project)
Cell Biology (Compulsory Elective Subject - Project)
Life Science Engineering (Compulsory Elective Subject - Project)

Credits	Grading	Recurrence	Duration	Language	Level	Version
7 CP	pass/fail	Irregular	1 term	German/English	4	1

Mandatory			
T-CHEMBIO-111223	Pathophysiology, Molecular Basis of Diseases (Practical Project)	7 CP	

Prerequisites
none

Competence Goal
In the practical course, students work independently on aspects of ongoing research projects.

The background is to investigate the pathophysiology of human cardiovascular diseases using zebrafish as a model organism and to open up new possibilities for future therapeutic approaches. The focus is on the basics of:

(1) Regeneration of the nervous tissue.

(2) The reciprocal influence of neural development and vascular development.

(3) Regulation of the development of a blood vessel system.

They learn to present their results professionally in the form of a final presentation.

Content
The content is based on the current research priorities. These can be found at: http://zebio.zoo.kit.edu/64.php

The range of methods includes :

- the creation of new constructs for transfection and/or injection experiments,
- live-cell analysis of transgenic zebrafish embryos
- gene knock-out and/or knockdown
- gene expression analysis
- injections into zebrafish oocytes

Additional Information
Module frequency: In each block by arrangement

Module duration: 4 weeks, full-time

Declaration according to § 30a LHG

Information on the animals and their use.

This module**involves**working with animals. Zebrafish from the laboratory's own husbandry are mated to obtain embryos. Studies are carried out on these embryos up to an age of 5 dpf. Fin-clips of adult animals can also be produced All husbandry and procedures are approved by the responsible regional council.

Reasons why the use of animals cannot be dispensed with in this module

The development of the vertebrate vascular system is based on complex interactions between the cell types involved. Often only some of the cell types or proteins involved have been identified. Consequently, these questions cannot be fully investigated in *in vitro culture systems*, as not all molecular parameters are known that would have to be reconstructed in these systems. Furthermore, the complex spatial environment into which the developing vessel grows cannot be fully simulated in culture.

Information on the courses and performance assessments to which students can alternatively switch

This is an elective course; students can alternatively take other FOR/PRO modules that do not involve working with animals.

Teaching and Learning Methods
Practical course

Literature

-Scott F. Gilbert, Developmental Biology, 7th ed., Sinauer, 2006

-Lewis Wolpert, Developmental Biology, Spektrum Verlag, 2007

-Internet materials at http://www.zi2.uni-karlsruhe.de/hauptstudium_ss.html

M 8.33 Module: Project Module: Phenomics and Chemomics (M5314) [M-CHEMBIO-106841]

Coordinators: Dr. Thomas Dickmeis
Prof. Dr. Lennart Hilbert

Organisation: KIT Department of Chemistry and Biosciences

Part of: Genetics (Compulsory Elective Subject - Project)
Molecular Biology (Compulsory Elective Subject - Project)
Biochemistry (Compulsory Elective Subject - Project)
Biotechnology (Compulsory Elective Subject - Project)
Life Science Engineering (Compulsory Elective Subject - Project)

Credits	Grading	Recurrence	Duration	Language	Level	Version
7 CP	graded	Each term	1 term	German	4	1

Mandatory			
T-CHEMBIO-113722	Phenomics and Chemomics (Practical Project)	7 CP	Dickmeis, Hilbert

M 8.34 Module: Project Module: Plant Cell Biology (M1301) [M-CHEMBIO-100202]

Coordinators: Prof. Dr. Peter Nick
Organisation: KIT Department of Chemistry and Biosciences
Part of: Botany (Compulsory Elective Subject - Project)
Developmental Biology (Compulsory Elective Subject - Project)
Molecular Biology (Compulsory Elective Subject - Project)
Cell Biology (Compulsory Elective Subject - Project)
Life Science Engineering (Compulsory Elective Subject - Project)

Credits	Grading	Recurrence	Duration	Language	Level	Version
7 CP	graded	Irregular	1 term	English	4	1

Mandatory			
T-CHEMBIO-100410	Research Projects in Plant Cell Biology (Practical Project)	7 CP	

Assessment
Examination is an ungraded coursework.

Prerequisites
none

M 8.35 Module: Project Module: Plant Evolution: Methods and Concepts (M1302) [M-CHEMBIO-100203]

Coordinators: Prof. Dr. Peter Nick
Organisation: KIT Department of Chemistry and Biosciences
Part of: Botany (Compulsory Elective Subject - Project)
Genetics (Compulsory Elective Subject - Project)
Molecular Biology (Compulsory Elective Subject - Project)
Biotechnology (Compulsory Elective Subject - Project)
Life Science Engineering (Compulsory Elective Subject - Project)
Taxonomy and Geoecology

Credits	Grading	Recurrence	Language	Level	Version
7 CP	pass/fail	Irregular	English	4	1

Mandatory			
T-CHEMBIO-100411	Research Projects in Plant Evolution (Practical Project)	7 CP	

Prerequisites
none

Literature
http://www.botanik.kit.edu/botzell/579.php
andhttp://www.botanik.kit.edu/botzell/english/26.php

M 8.36 Module: Project Module: Plant Gene Technology - Precise Genome Engineering (M2301) [M-CHEMBIO-100228]

Coordinators: Prof. Dr. Holger Puchta
Organisation: KIT Department of Chemistry and Biosciences
Part of: Botany (Compulsory Elective Subject - Project)
Genetics (Compulsory Elective Subject - Project)
Molecular Biology (Compulsory Elective Subject - Project)
Biotechnology (Compulsory Elective Subject - Project)
Life Science Engineering (Compulsory Elective Subject - Project)

Credits	Grading	Recurrence	Duration	Language	Level	Version
7 CP	pass/fail	Irregular	1 term	German	4	1

Mandatory			
T-CHEMBIO-100435	Practical in Gene Technology (Practical Project)	7 CP	

Assessment
The project module is an ungraded coursework

Prerequisites
none

Literature
Gentechnik bei Pflanzen (F. u. R. Kempken), Springer, 2012
Lewin's Genes XI (Krebs, Goldstein und Kilpatrick), Jones and Barlett, 2013
Molecular Biology of the Gene (Watson et al.), Cummings, 2013
Molekulare Genetik (Nordheim und Knippers), Thieme Verlag, 2015
Genome und Gene (T.A. Brown), Spektrum Akademischer Verlag, 2007
Der Experimentator: Molekularbiologie / Genomics (Mülhardt), Spektrum Akademischer Verlag, 2013

M 8.37 Module: Project Module: Plant Molecular Biology (M2300) [M-CHEMBIO-100214]

Coordinators: Prof. Dr. Holger Puchta
Organisation: KIT Department of Chemistry and Biosciences
Part of: Botany (Compulsory Elective Subject - Project)
Molecular Biology (Compulsory Elective Subject - Project)
Life Science Engineering (Compulsory Elective Subject - Project)

Credits	Grading	Recurrence	Duration	Language	Level	Version
7 CP	graded	Each term	1 term	German/English	4	2

Mandatory			
T-CHEMBIO-100420	Plant Molecular Biology (Practical Project)	7 CP	

Assessment
The examination an ungraded coursework.

Prerequisites
none

Competence Goal
The following teaching goals are supposed to be reached:

- You learn to work on a current scientific question
- You apply plant molecular biology methods
- You document your results in a lab journal
- You discuss your results with your colleagues/supervisors
- You search for literature to solve problems
- You write a scientific report in which the methods and your results are presented

Content
Supervised by a doctoral student or a postdoc you will work on a small scientific project. This project will be taken from current scientific problems at the institute and might therefore directly influence the research of your supervisor. You will theoretically prepare the necessary scientific background. You design and carry out your experiments with the help of the supervisor, write down your results, and discuss your results with the team. At the end you write a report that fulfills the requirements of a scientific text.

Recommendations
Assignment of M2201

M 8.38 Module: Project Module: Project in Technical Biology (M9304) [M-CIWVT-100307]

Coordinators: Prof. Dr.-Ing. Dirk Holtmann
Organisation: KIT Department of Chemical and Process Engineering
Part of: Microbiology (Compulsory Elective Subject - Project)
Molecular Biology (Compulsory Elective Subject - Project)
Biotechnology (Compulsory Elective Subject - Project)

Credits	Grading	Recurrence	Duration	Language	Level	Version
7 CP	graded	Irregular	1 term	German	4	2

Mandatory			
T-CIWVT-100560	Project in Technical Biology (Practical Projekt)	7 CP	Holtmann

Prerequisites
none

M 8.39 Module: Project Module: Research Based on Scientific Collections at the Natural History Museum (MPRO8302) [M-CHEMBIO-107582]

Coordinators: Prof. Dr. Martin Husemann
Organisation: KIT Department of Chemistry and Biosciences
Part of: Zoology (Compulsory Elective Subject - Project)
Taxonomy and Geoecology

Credits	Grading	Recurrence	Duration	Language	Level	Version
7 CP	pass/fail	Each term	1 term	German/English	4	1

Mandatory			
T-CHEMBIO-114851	Research Based on Scientific Collections at the Natural History Museum (Practical Project)	7 CP	

Assessment
Final report

Prerequisites
Interest in biodiversity and museum collections

Competence Goal

- Museum work with natural history collections
- Faunistics
- literature work
- taxonomy
- Knowledge of species
- phylogeny
- Biodiversity research

Content
Will be discussed with the lecturer and developed according to the learning objectives

Additional Information
Work in the Natural History Museum at Erbprinzenstraße 13, 76133 Karlsruhe / field work if necessary

Workload
4 weeks practical work, time allocation variable

Teaching and Learning Methods
Practical

M 8.40 Module: Project Module: Signal Transduction in Eukaryotic Systems (M3309) [M-CHEMBIO-100229]

Coordinators: Prof. Dr. Véronique Orian-Rousseau
Dr. Carsten Weiss

Organisation: KIT Department of Chemistry and Biosciences

Part of: Genetics (Compulsory Elective Subject - Project)
Molecular Biology (Compulsory Elective Subject - Project)
Life Science Engineering (Compulsory Elective Subject - Project)

Credits	Grading	Recurrence	Duration	Language	Level	Version
7 CP	graded	Irregular	1 term	German	4	1

Mandatory			
T-CHEMBIO-100439	Signal Transduction in Eukaryotic Systems (Practical Project)	7 CP	

Prerequisites
none

M 8.41 Module: Project Module: Structure and Function of Peptides (M7301) [M-CHEMBIO-100271]

Coordinators: Prof. Dr. Anne Ulrich
Organisation: KIT Department of Chemistry and Biosciences
Part of: Biochemistry (Compulsory Elective Subject - Project)
Life Science Engineering (Compulsory Elective Subject - Project)

Credits	Grading	Recurrence	Duration	Language	Level	Version
7 CP	graded	Irregular	1 term	German	4	1

Mandatory			
T-CHEMBIO-100519	Biochemistry - Peptide Structure and Function (Practical Project)	7 CP	

M 8.42 Module: Project module: Systemic Cellular Neurobiology (MPRO5320) [M-CHEMBIO-106854]

Coordinators: Prof. Dr. Simone Mayer
Organisation: KIT Department of Chemistry and Biosciences
Part of: Zoology (Compulsory Elective Subject - Project)
Developmental Biology (Compulsory Elective Subject - Project)
Molecular Biology (Compulsory Elective Subject - Project)
Cell Biology (Compulsory Elective Subject - Project)
Biochemistry (Compulsory Elective Subject - Project)
Biotechnology (Compulsory Elective Subject - Project)

Credits	Grading	Recurrence	Duration	Language	Level	Version
7 CP	pass/fail	Each term	1 term	English	4	1

Mandatory			
T-CHEMBIO-113738	Systemic cellular neurobiology (Practical Project)	7 CP	Mayer

Assessment
Study Achievment: practical work, literature research, presentation, report

Competence Goal
Scientific thinking, laboratory or bioinformatic methods

Content
Insights into neurobiology: to generate and analyze cell culture models of brain development

Additional Information
Please get in touch at least 8 weeks before the desired start of the module

Workload
175

Recommendations
Knowledge in neurobiology and developmental biology

Teaching and Learning Methods
Practical Work

Literature
Review Paper: Khakipoor S, Crouch EE, Mayer S. Human organoids to model the developing human neocortex in health and disease. Brain Res. 2020 Sep 1;1742:146803. doi: 10.1016/j.brainres.2020.146803. Epub 2020 Mar 30. PMID: 32240655; PMCID: PMC7352040.

Base For
Master thesis in Systemic Cellular Neurobiology

M 8.43 Module: Project Module: Systems Biology & Biophysics (M5308) [M-CHEMBIO-105305]

Coordinators: Prof. Dr. Lennart Hilbert
Organisation: KIT Department of Chemistry and Biosciences
Part of: Genetics (Compulsory Elective Subject - Project)
Zoology (Compulsory Elective Subject - Project)
Developmental Biology (Compulsory Elective Subject - Project)
Molecular Biology (Compulsory Elective Subject - Project)
Cell Biology (Compulsory Elective Subject - Project)
Biophysics (Compulsory Elective Subject - Project)
Biochemistry (Compulsory Elective Subject - Project)
Life Science Engineering (Compulsory Elective Subject - Project)

Credits	Grading	Recurrence	Duration	Language	Level	Version
7 CP	pass/fail	Irregular	1 term	German	4	1

Mandatory			
T-CHEMBIO-110791	Systems Biology & Biophysics (Practical Project)	7 CP	Hilbert

Assessment
The project module is an ungraded coursework. Control of Success is a written Protocol or a presentation in the working group

Prerequisites
none

M 8.44 Module: Project Module: Tissue Engineering and 3D Cell Culture (M3307) [M-CHEMBIO-101597]

Coordinators: Prof. Dr. Ute Schepers
Organisation: KIT Department of Chemistry and Biosciences
Part of: Genetics (Compulsory Elective Subject - Project)
Molecular Biology (Compulsory Elective Subject - Project)
Cell Biology (Compulsory Elective Subject - Project)
Biochemistry (Compulsory Elective Subject - Project)
Biotechnology (Compulsory Elective Subject - Project)
Life Science Engineering (Compulsory Elective Subject - Project)

Credits	Grading	Recurrence	Duration	Language	Level	Version
7 CP	pass/fail	Irregular	1 term	German	4	1

Mandatory			
T-CHEMBIO-103059	Tissue Engineering and 3D Cell Culture (Practical Project)	7 CP	

Prerequisites
None

Competence Goal
The students get an overview of the chemical and biological basics of tissue engineering. This includes: Chemical synthesis of hydrogels for cell culture, chemical analysis of synthesized gels, basics of 2D and 3D cell culture of human cells, formation of spheroids, embedding of cells in hydrogels and microscopic analysis of the formed structures.

Content

- Techniques in 2D cell culture
- Techniques in 3D cell culture
- Formation of spheroids
- Viability assay
- Fluorescence staining
- Toxicity screening of nanoparticles on spheroids
- Microscopy/Fluorescence Microscopy
- Chemical synthesis of hydrogels for application in 3D cell culture
- Chemical characterization of hydrogels
- Physical characterization of photoinitiators for application in 3D cell culture

M 8.45 Module: Project Module:Productive Biofilms (M4310) [M-CHEMBIO-105603]

Coordinators: Dr. Gunnar Sturm
Dr. Katrin Sturm-Richter

Organisation: KIT Department of Chemistry and Biosciences

Part of: Genetics (Compulsory Elective Subject - Project)
Microbiology (Compulsory Elective Subject - Project)
Molecular Biology (Compulsory Elective Subject - Project)
Biotechnology (Compulsory Elective Subject - Project)

Credits	Grading	Recurrence	Duration	Language	Level	Version
7 CP	pass/fail	Each term	1 term	German	4	1

Mandatory			
T-CHEMBIO-111231	Productive Biofilms (Practical Project)	7 CP	Sturm

Prerequisites
Research module **Productive Biofilms** (M4209)

M 8.46 Module: Research and Project Module: Toxicology and Food Toxicology (M8201) [M-CHEMBIO-105673]

Coordinators: Prof. Dr. Andrea Hartwig
PD Dr. Beate Monika Köberle
Dr. Carsten Weiss

Organisation: KIT Department of Chemistry and Biosciences

Part of: Toxicology

Credits	Grading	Recurrence	Duration	Language	Level	Version
17 CP	graded	Each summer term	1 term	German	4	1

Mandatory			
T-CHEMBIO-111325	Toxicology and Food Toxicology	7 CP	Köberle, Weiss
T-CHEMBIO-111326	Toxicology (Laboratory Practical Course)	10 CP	Köberle, Weiss

Prerequisites
keine

Modeled Prerequisites
The following conditions have to be fulfilled:

1. The module component T-CHEMBIO-104464 - Food Toxicology must have been started.

Competence Goal
Different methods of toxicity testing will be used

M 8.47 Module: Research Module: Bioinformatics (M4211) [M-CHEMBIO-106206]

Coordinators: Prof. Dr. Anne-Kristin Kaster
Dr. John Vollmers

Organisation: KIT Department of Chemistry and Biosciences

Part of: Genetics (Compulsory Elective Subject - Research)
Microbiology (Compulsory Elective Subject - Research)
Molecular Biology (Compulsory Elective Subject - Research)
Life Science Engineering (Compulsory Elective Subject - Research)

Credits	Grading	Recurrence	Duration	Language	Level	Version
8 CP	graded	Each winter term	1 term	German/English	4	2

Election Notes
The distribution of places in the internships is carried out in the so-called module selection.
Information and current links can be found at: http://www.biologie.kit.edu/133.php

Mandatory			
T-CHEMBIO-112608	Bioinformatics	8 CP	Kaster, Vollmers

Assessment
Other type of examination

- 80 points - written examination
- 10 points - practical work and report
- 10 points - final presentation/lecture

Competence Goal
Experience in processing and analyzing Next Generation Sequencing (NGS) data in the context of genome and metagenome analyses with open source UNIX command line tools.

Content
Microbial sequence data obtained at the Institute of Biological Interfaces 5 (IBG-5) are processed, assembled and analyzed. The aim is to reconstruct genomes of individual microorganisms in order to gain insights into the lifestyle of these organisms. In this context, the necessary basic experience in working at UNIX command line level is also taught.
content is taught in a combination of lectures, seminars and supervised work ("Hackathon").

Additional Information
The practical will take place all day at the North Campus in Eggenstein Leopoldshafen.

Workload
Attendance time:

- Lecture: 15 h; 1 SWS; 1 CP
- Practical course: 120 h; 6 SWS; 7 LP

Preparation and follow-up time:

- Lecture: 15 h
- Practical course: 90 h

Teaching and Learning Methods
Lecture, practical course, presentation

M 8.48 Module: Research Module: From Samples to Sequences (M4212) [M-CHEMBIO-105666]

Coordinators: Prof. Dr. Anne-Kristin Kaster
Organisation: KIT Department of Chemistry and Biosciences
Part of: Genetics (Compulsory Elective Subject - Research)
Microbiology (Compulsory Elective Subject - Research)
Molecular Biology (Compulsory Elective Subject - Research)
Biotechnology (Compulsory Elective Subject - Research)
Life Science Engineering (Compulsory Elective Subject - Research)

Credits	Grading	Recurrence	Duration	Language	Level	Version
8 CP	graded	Each summer term	1 term	German/English	4	1

Mandatory			
T-CHEMBIO-111319	From Samples to Sequences	8 CP	

Assessment
Examination performance of a different kind consisting of:

- written test of 120 minutes, on the lecture and the contents of the internship. 80 points of the total score can be achieved.
- a report on the internship must be prepared, which must meet scientific standards. 20 points can be obtained.

Prerequisites
none

Competence Goal
The learning objective is to provide the participants with the necessary practical knowledge and theoretical basis to take samples in the environment, extract DNA and prepare it for sequencing. Furthermore, to independently use a processing, assembly and analysis pipelines for sequence data analysis to determine the microbial composition of the sample (metagenomics).

Content
Lecture (1SWS) and practical course (7SWS)

-Sample collection
-DNA extraction
-DNA quantitation and quality determination
-PCR
-Library prep
-Bioinformatic data analysis

Teaching and Learning Methods
Lecture, practical course, presentation

M 8.49 Module: Research Module: Advanced Transcriptomic Analysis (MFOR5221) [M-CHEMBIO-107587]

Coordinators: Prof. Dr. Simone Mayer
Organisation: KIT Department of Chemistry and Biosciences
Part of: Zoology (Compulsory Elective Subject - Research)
Developmental Biology (Compulsory Elective Subject - Research)
Molecular Biology (Compulsory Elective Subject - Research)
Cell Biology (Compulsory Elective Subject - Research)
Biotechnology (Compulsory Elective Subject - Research)

Credits	Grading	Recurrence	Duration	Language	Level	Version
8 CP	graded	Each winter term	1 term	English	4	1

Mandatory			
T-CHEMBIO-114861	Advanced Transcriptomic Analysis	8 CP	Mayer

Assessment
Success is assessed in the form of a different type of examination.
A total of 100 points can be earned.

- One part of the examination takes the form of a written test on the lecture and the content of the practical course. This part of the examination can be used to achieve 80 points of the total number of points.
- In addition to this written test, a report on the internship must be prepared, which must meet scientific standards. 10 points can be obtained for this report.
- A presentation must also be given. 10 points can also be earned for this part.

Prerequisites
MFOR5220: Research module - Transcriptome analysis

Competence Goal
The aim of the course is to get to know and apply various current pipelines for single-cell sequencing. Furthermore, strategies for experimental design and the conception of scientific projects are taught. In addition, students are trained to understand and critically discuss scientific work and to present it in various ways.

Content
Advanced single-cell transcriptomics and data analysis in Python

This scientific module builds on the foundations developed in the introductory course and focuses on advanced computational strategies for analyzing single-cell RNA sequencing data using Python-based tools. The module combines theoretical instruction with extensive practice using Jupyter notebooks and emphasizes reproducible and scalable workflows using widely available Python packages. Specifically, students will perform the entire scRNA-seq analysis pipeline using Scanpy, including quality control, normalization, dimensionality reduction, clustering, and data visualization. In addition, students will apply methods for automated cell type annotation such as CellTypist, apply gene regulatory network inference tools such as SCENIC, including analysis of transcription factor activity, and learn techniques to analyze cell-cell communication using tools such as CellChat.

Additional Information
Repeated every winter semester, 2. block
4 weeks full time

Workload
240 h

Recommendations
Wolf, F., Angerer, P. & Theis, F. SCANPY: large-scale single-cell gene expression data analysis. Genome Biol 19, 15 (2018). https://doi. org/10.1186/s13059-017-1382-0

Jin, S., Plikus, M.V. & Nie, Q. CellChat for systematic analysis of cell-cell communication from single-cell transcriptomics. Nat Protoc 20, 180-219 (2025). https://doi.org/10.1038/s41596-024-01045-4

Aibar, S., González-Blas, C., Moerman, T. et al. SCENIC: single-cell regulatory network inference and clustering. Nat Methods 14, 1083-1086 (2017). https://doi. org/10.1038/nmeth.4463

Teaching and Learning Methods
Lecture, seminar, practical course

Base For
Research module - Advanced Transcriptomic Analysis

M 8.50 Module: Research Module: Alpine Habitats (MFOR1211) [M-CHEMBIO-107564]

Coordinators: Maren Riemann

Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
KIT Department of Chemistry and Biosciences

Part of: Botany (Compulsory Elective Subject - Research)
Genetics (Compulsory Elective Subject - Research)
Microbiology (Compulsory Elective Subject - Research)
Zoology (Compulsory Elective Subject - Research)
Developmental Biology (Compulsory Elective Subject - Research)
Molecular Biology (Compulsory Elective Subject - Research)
Cell Biology (Compulsory Elective Subject - Research)
Taxonomy and Geoecology

Credits	Grading	Duration	Language	Level	Version
8 CP	graded	2 terms	German/English	4	1

Mandatory			
T-CHEMBIO-114831	Alpine Habitats	8 CP	Riemann

Assessment
The performance assessment is a different type of examination (for details see partial performance)

Prerequisites
Prerequisite is successful completion of a module on plant identification

Competence Goal
Students are able to recognize the most important types of vegetation in the Alps in the field and assess them in a historical context. They are able to apply simple vegetation science methods and understand essential site-ecological relationships.

Content
Lecture (in the winter semester)

The living conditions in the Alps are a very special challenge for plants that cannot pack up or run away. Nevertheless, during the excursion we find ourselves in one of the areas of highest biodiversity in Europe.
This lecture presents the relationship between the Alpine flora and its habitat.
This includes, in particular, adaptation strategies to the different climatic and edaphic conditions. Different flora elements meet in the Alps, which makes them particularly interesting from a botanical point of view. Furthermore, basic geological and climatic as well as cultural backgrounds are dealt with.

Field course (end of July)

During various hikes and practical vegetation surveys, you will get to know a biodiversity hotspot in the Central Alps. Special attention is paid to the flora, its site gradients and site conditions. You will get to know extreme and impressive plant habitats from the montane to the alpine level, from bare rock faces and various grassland communities to glacier forelands.
We will also get to know the Alps as a cultural landscape and look at the history of the Alpine region. The excursion will also show us the drastic effects of climate change. Furthermore, you will learn how to use digital mapping methods and professional vegetation surveys and how to use identification literature and apps professionally.

Final event (end of September)

At this event, the results obtained will be presented and the herbarized material will be mounted

Module Grade Calculation
consists of a written part of the lecture (80%) and the final presentation (20%) (for details see partial performance)

Additional Information
Places will be allocated during the module selection for the winter semester 2026: 19-25 July

The trip to the excursion locations is organized with Stadtmobil buses.
Overnight accommodation is in a self-catering house (you cook for yourself)
https://www.flickr.com/photos/portfolio-marenriemann/albums/72157716279878401/
Hiking boots and fitness for 700 m are mandatory

First impressions

Workload
Attendance time:

- Lecture: 15 h; 1 SWS; 1 CP
- Practical course: 90 h; 6 SWS; 7 LP

Preparation and follow-up time:

- Lecture: 15 h
- Practical course: 120 h

Teaching and Learning Methods
Lecture, seminar, practical work

Literature
As most of the literature is available in German, the module is mainly held in German

M 8.51 Module: Research Module: Biomolecular Microanalytics (M3206) [M-CHEMBIO-100267]

Coordinators: Prof. Dr. Christof Niemeyer
Dr. Tim Scharnweber

Organisation: KIT Department of Chemistry and Biosciences

Part of: Molecular Biology (Compulsory Elective Subject - Research)
Biochemistry (Compulsory Elective Subject - Research)
Biotechnology (Compulsory Elective Subject - Research)
Life Science Engineering (Compulsory Elective Subject - Research)

Credits	Grading	Recurrence	Duration	Language	Level	Version
8 CP	graded	Each summer term	1 term	German/English	4	2

Mandatory			
T-CHEMBIO-108707	Biomolecular Microanalytics	8 CP	Niemeyer, Scharnweber

Competence Goal
Basic knowledge of miniaturized analytical methods, in particular the production and application of microarrays, as well as selected current application examples in the fields of biochemistry, microbiology and chemical biology

Content
Miniaturized analytical methods play a central role in the high-throughput analysis of biomacromolecules for applications in biochemistry, pharmaceutical research and medicine. Of particular importance are so-called "microarrays" with which many different biomolecular interactions can be characterized in parallel. This course teaches methods and applications of miniaturized analytical procedures.

- Bioconjugation: Chemical coupling of oligonucleotides, proteins and low-molecular probes.
- Surface chemistry: Immobilization of DNA, proteins and low-molecular components on glass substrates.
- Microstructuring: Piezodispensing for lateral structuring of probe molecules on activated glass substrates.
- Microanalysis: Fluorescence microscopy and densitometry to quantify biomolecular interactions..;
- Fluorescence and enzyme-enhanced detection techniques as analytical methods for microarray experiments

Additional Information
only in the summer semester

M 8.52 Module: Research Module: Cellular and Medicinal Microbiology (M4205) [M-CHEMBIO-105294]

Coordinators: Prof. Dr. Reinhard Fischer
PD Dr. Markus Schmidt-Heydt

Organisation: KIT Department of Chemistry and Biosciences

Part of: Genetics (Compulsory Elective Subject - Research)
Microbiology (Compulsory Elective Subject - Research)
Molecular Biology (Compulsory Elective Subject - Research)
Cell Biology (Compulsory Elective Subject - Research)
Life Science Engineering (Compulsory Elective Subject - Research)

Credits	Grading	Recurrence	Duration	Language	Level	Version
8 CP	graded	Each summer term	1 term	German	4	1

Mandatory			
T-CHEMBIO-110761	Cellular and Medicinal Microbiology	8 CP	

Assessment
The control of success is an examination of another type. The Maximum 100 points can be reached. These points consits the following components:

- On examination is an oral part,with this performance 90 points can be reached.
- Beside this written test, a protocol of the practical part must be written. This protocol must be in accordance with scientific requirements.
  For this protocol 10 points can be reached.

Prerequisites
none

Competence Goal
You will improve the following qualifications

- You will broaden your understanding of the concepts and actual scientific questions in the field
- You will read original papers and improve in understanding and evaluating their content
- You will work practically in the lab for about 4 weeks
- You will improve your skills for scientific working
- You will be working in small teams
- You will improve your oral and written scientific presentation skills
- You will be exposed to an international atmosphere and learn how to work in an international team

Content
Course I, Cellular Microbiology (2 weeks):

In this course we are going to analyze the role of the microtubule and the actin cytoskeleton in the filamentous fungus *Aspergillus nidulans*. We will study the role of cell end marker and motor proteins. The interaction of the components will be studied by microscopic, genetic and biochemical methods.

Practical part:

- Generation of transgenic *Aspergillus nidulans* strains
- Characterization by Southern blot
- Fluorescence microscopy to detect specific proteins and to proof the interaction of two proteins of interest
- Confocal Laser microscopy
- Yeast-Two-Hybrid analysis, generation of transgenic *Saccharomyces cerevisiae* strains, Westernblot to quantify the proteins in yeast
- Co-Immunoprecipitation
- Purification of a kinesin motor protein from *coli*
- Nanotechnology: *In vitro* assay for the analysis of the motor activity

Lectures:

- The eukaryotic Cytoskeleton
- The discovery of cell end marker proteins
- Polarized growth in fungi
- Organelle movement
- Nanotechnology

Course II, Medical Microbiology (2 weeks):

The prerequisite for an adequate microbiological risk analysis in medical and food-related areas, is the analysis of involved microorganisms. In this course, you will learn how to isolate and enrich microorganisms of medical and food toxicological relevance from environmental samples (e.g. skin, hair, soil, food). With modern analytical and molecular biological methods, you will further investigate and characterize these self-enriched pure cultures.

By participating in this course, you will be able to professionally isolate microorganisms, produce pure cultures and characterize them chemically-morphologically and molecular biologically.

Practical part:

- Production of selective growth media
- Cultivation of microorganisms from environmental samples (skin, hair, soil, food); Preparation of dilution series and pure cultures
- Staining methods (e.g. Calcofluor-white)
- Binocular and microscopic examination of the preparations; morphological analysis of microorganisms, identification of important filamentous fungi at genus level
- Chemical extraction of secondary metabolites from mycotoxigenic filamentous fungi, thin layer chromatographic separation, chemotype-fingerprinting, analysis and identification of metabolites with reference standard
- Isolation of genomic DNA, creation of DNA primers for PCR analysis
- Perform RAPD-PCR, gel electrophoresis, evaluation and characterization
- PCR-fragment tree analysis

Lectures:

- Basics and definitions of medical mycology
- Occurrence and significance of pathogenic and mycotoxigenic fungi
- Important fungal genera and species
- Economic and ecological relevance of filamentous fungi
- Classification of pathogenic yeasts / fungi according to DHS scheme
- Dimorphisms in fungi as an adaptation to the host
- Diseases: mycoses, mycotoxicoses, mycogenic allergies
- Regulation of secondary metabolite biosynthesis at the molecular level, involved signal cascades
- Therapy and prevention of contamination / infection by filamentous fungi

M 8.53 Module: Research Module: Chromatin Structures in Cell Division and Development (M7202) [M-CHEMBIO-105842]

Coordinators: Prof. Dr. Sylvia Erhardt
Organisation: KIT Department of Chemistry and Biosciences
Part of: Genetics (Compulsory Elective Subject - Research)
Zoology (Compulsory Elective Subject - Research)
Developmental Biology (Compulsory Elective Subject - Research)
Molecular Biology (Compulsory Elective Subject - Research)
Cell Biology (Compulsory Elective Subject - Research)
Life Science Engineering (Compulsory Elective Subject - Research)

Credits	Grading	Duration	Language	Level	Version
8 CP	graded	1 term	English	4	2

Mandatory			
T-CHEMBIO-111754	Chromatin Structures in Cell Division and Development	8 CP	Erhardt

Assessment
The control of success takes place in the form of an **examination of a different kind**.

One part of the performance review takes the form of a written test of approx. 90 minutes on the lecture and the contents of the internship. About this part of the examination 80% of the points can be reached. In addition to this written test, a protocol for the practical course must be prepared, which must meet scientific standards. Additionally, a method of chromatin research has to be presented as a short lecture (topics will be assigned). By protocol and short presentation 20% of the points can be reached.

Competence Goal
They should achieve the following learning objectives:

Basic understanding of chromatin structures and how they change during cell division.
You will acquire the basics of research with the fruit fly Drosophila melanogaster.
You will acquire methods to specifically visualize chromatin structures in cells.
You will acquire methods to specifically characterize chromatin structures at the molecular level.
You will be able to understand results from these experiments and
You will be able to present and discuss theoretical and practical details of these experiments orally and in writing (partly also in English).

Content
The module is designed to provide an in-depth look at current research directions in chromatin biology. We will incorporate current aspects of our research group to teach you about the molecular biology of chromatin and how it affects the cell cycle. Experiments, which include current research topics of the group, will introduce current techniques and questions to the participating students. Under guidance, experiments will be performed, evaluated and interpreted independently. This also includes the theoretical follow-up of the experiments and the writing of a detailed protocol.

Additional Information
A large part of the internship is held in English

Workload
Attendance time:

- Lecture: 15 h; 1 SWS; 1 LP
- Practical course: 90 h; 6 SWS; 7 LP

Preparation and wrap-up time:

- Lecture: 15 h
- Practical course: 120 h

Teaching and Learning Methods
Lecture, practical course, presentation

Literature

- Paro, Grossniklaus, Santoro: Introduction to Epigenetics (open access) Springer. ISBN 978-3-030-68669-7, available April 2021
- Nordheim, Knippers et al: Molecular Genetics ISBN 9783132426375
- Duffy JB: GAL4 system in Drosophila: a fly geneticist's Swiss army knife DOI: 1002/gene.10150
- Martire, Banaszynki: The roles of histone variants in fine-tuning chromatin organization and function https:// nature.com/articles/s41580-020-0262-8

M 8.54 Module: Research Module: Developmental Neurobiology (M5207) [M-CHEMBIO-100249]

Coordinators: Prof. Dr. Martin Bastmeyer
Dr. Sepand Rastegar
Dr. Franco Weth

Organisation: KIT Department of Chemistry and Biosciences

Part of: Zoology (Compulsory Elective Subject - Research)
Developmental Biology (Compulsory Elective Subject - Research)
Molecular Biology (Compulsory Elective Subject - Research)
Cell Biology (Compulsory Elective Subject - Research)
Biophysics (Compulsory Elective Subject - Research)
Life Science Engineering (Compulsory Elective Subject - Research)

Credits	Grading	Recurrence	Duration	Language	Level	Version
8 CP	graded	Each winter term	1 term	German/English	4	3

Mandatory			
T-CHEMBIO-108677	Developmental Neurobiology	8 CP	Bastmeyer, Bentrop

Assessment
Success is assessed in the form of a different type of examination.
A total of 100 points can be earned.

- The first part of the examination is a written exam lasting 120 minutes on the lecture and the content of the practical course. Up to 80 points can be achieved in this part of the examination.
- In addition to this written test, a report on the internship must be prepared, which must meet scientific standards. Up to 10 points are awarded for this report.
- A presentation must also be given. 10 points can also be earned for this part.

Prerequisites
none

Competence Goal
Students will.

-Know and understand the conceptual subject matter in the field of neurodevelopmental biology,

-can critically read and evaluate relevant literature,

-know, understand, and master current experimental methods in neurobiology,

-are able to investigate scientific questions in teamwork,

-can professionally document experimental results through reliable laboratory record keeping,

-Will be able to present and analyze the problem of an experiment and its execution, the results and their interpretations in a protocol,

-can present a scientific project in a clear, understandable and reflective manner.

Content
Lecture:

This lecture introduces concepts and methods of modern neurodevelopmental biology.

Aspects covered:

-molecular organization, structure, and function of the vertebrate nervous system.

-axonal growth and axonal pathfinding

-neuronal development and regeneration

Model systems: Cell culture, zebrafish, mouse

Practicum:

Students complete small scientific projects based on current research priorities. They read original literature, write a final protocol in the form of a short scientific publication, and present their project in an oral presentation.

Possible areas of focus:

-Neurodevelopmental biology of mouse and zebrafish.

-RNA antisense techniques, manipulation of protein expression

-Establishment of neuronal cell cultures

-Retinal explants

-Biofunctionalization of surfaces

-In situ hybridization, cloning, qPCR

-immunostaining, digital fluorescence microscopy. quantitative image analysis

Additional Information
Module rotation: WS: 1st block period

Module duration: 4 weeks, full day

Declaration according to § 30a LHG

Information about animals and their use.

Inthis module work is done with animals. Zebrafish from the laboratory's own husbandry are mated to obtain embryos. Studies on these embryos will take place up to 5 dpf of age. Fin clips from adults can also be made. Molecular biology and histology studies are performed on organs from laboratory-bred mice. Chicken eggs for embryo collection (E6 of 21) are obtained from a commercial breeding operation. All husbandry and interventions are approved by the responsible regional council.

Reasons why the use of animals in this module cannot be dispensed with

The development of the nervous system in vertebrates is based on complex interactions between the cell types involved. Often, only some of the cell types or proteins involved have been identified. Consequently, these issues cannot be fully investigated in *in vitro culture systems*, because not all molecular parameters are known that would need to be reconstructed in these systems. Also, the complex spatial environment in which neurons differentiate cannot be fully simulated in culture.

Information about the courses or performance assessments students can alternatively take

This is an elective course; students may alternatively take other FOR/PRO modules that do not involve animals.

Workload
Attendance time:

- Lecture: 15 h; 1 SWS; 1 LP
- Practical course: 90 h; 6 SWS; 7 LP

Preparation and wrap-up time:

- Lecture: 15 h
- Practical course: 120 h

Teaching and Learning Methods
Lecture, seminar, practical course

Literature
Lecture notes

Brown, Keynes, Lumsden: The developing brain

Sanes, Reh, Harris: Development of the nervous system

Purves et al.: Neuroscience

Alberts et al.: Molecular Biology of the Cell

Lodish et al.: Molecular Cell Biology

Karp: Molecular Cell Biology

Pollard; Cell Biology

M 8.55 Module: Research Module: Diversity, Systematics and Evolution of Insects (MFOR8203) [M-CHEMBIO-107269]

Coordinators: Prof. Dr. Martin Husemann
Organisation: KIT Department of Chemistry and Biosciences
Part of: Zoology (Compulsory Elective Subject - Research)
Taxonomy and Geoecology

Credits	Grading	Recurrence	Duration	Language	Level	Version
8 CP	graded	Each summer term	1 term	English	4	1

Mandatory			
T-CHEMBIO-114315	Diversity, Systematics and Evolution of Insects	8 CP	Husemann

Competence Goal
Understanding the diversity and systematics of insects, evolutionary biology basics, writing scientific articles, project planning and implementation, molecular and ecological methods, writing a scientific article, scientific presentation with discussion.

Content
Insects are the most species-rich group of animals on earth. They have conquered almost all habitats and are adapted in many ways. In the course, the diversity and systematics of insects are taught in a lecture and various methods of studying insect diversity are described. In the seminar, current studies on insect systematics and their evolution are presented by the students. In the practical course, students investigate specific topics on the taxonomy, systematics or ecology of this fascinating group of animals in small projects of their own design. The results are presented in a lecture and summarized in a scientific study.

Teaching and Learning Methods
Lecture, seminar and practical course

M 8.56 Module: Research Module: Ecology of City Trees under Global Change (MFOR1220) [M-CHEMBIO-106908]

Coordinators: Dr. Somidh Saha
Organisation: KIT Department of Chemistry and Biosciences
Part of: Botany (Compulsory Elective Subject - Research)
Taxonomy and Geoecology

Credits	Grading	Recurrence	Duration	Language	Level	Version
8 CP	graded	Each winter term	1 term	German/English	4	2

Mandatory			
T-CHEMBIO-113844	Ecology of City Trees under Global Change	8 CP	Saha

Assessment
Testing of a different kind

Prerequisites
Motivation to connect biological principles and theory to urban ecology and applications; motivation to be outdoors and in the classroom for linking theory to practicals.

Competence Goal
Students will learn:

- about ecosystem services (e.g., heat stress mitigation, air quality improvement, flood reductions, habitat provision, and human wellbeing) provided by the trees growing inside cities or forests within or next to cities;
- how multiple biotic and abiotic factors impact the provision of ecosystem services from city trees;
- how environmental stress impacts tree growth and ecophysiological functions in city trees;
- about the potential of large trees in cities for the provision of habitats for biodiversity;
  about the basics of urban tree management, arboriculture, and tree care.

Content
Topics covered in classroom lectures:

- ecosystem services from city trees;
- factors influencing the supply and trade-off between ecosystem services;
- stress ecology of city trees with emphasis on ecophysiology, tree health assessment, and dendroecology;
- impact of pollution on functioning of city trees;
- impact of city trees and biodiversity on maintaining human wellbeing;
- urban tree management, introduction to arboriculture and tree care.

Topics for practical:

- Students will be introduced to the topic of tree-related microhabitat in the practical course, which they need to undertake.
- Students can form a group and collect data on tree size, species, neighborhood, and a variety of tree-related microhabitats (e.g., vertebrate nests, woodpecker holes, dendrotelms, other tree cavities, moss, lichen, lianas, etc.) on selected trees in Karlsruhe.
- They will be provided with all necessary tools and instruments required for data collection. After that, they will present their work in a student seminar (evaluation: single or group presentation,10% marks)

Introduction to novel methods during the course:

- Measuring soil respiration and photosynthesis with LiCOR systems;
- Analyzing heavy metals in urban soils via XRF spectroscopy;
- Using sonic tomography to assess internal trunk damage in trees;
- Conducting urban tree inventories during field surveys.

Module Grade Calculation
Written examination (80 points); presentation and the practical course with the report (20 points)

Additional Information
Some data collection activities will take place outside the classroom, such as on trees near streets or in parks and forests during the winter. Students are requested to prepare for field activities in winter.

Workload
240

Recommendations
Students are recommended not to miss any theory, practical, or laboratory classes.

Teaching and Learning Methods
Lectures (3 hours per day for 4 weeks in the forenoon); outdoor/laboratory demonstration and exercises (3 hours per day for 4 weeks in the afternoon)

Literature
Schulze, E.D., Beck, E. and Müller-Hohenstein, K., 2005. Plant ecology. Springer Science & Business Media

Ferrini, F., Van den Bosch, C.C.K. and Fini, A. eds., 2017. Routledge handbook of urban forestry (p. 524). Routledge, Abingdon: Routledge.

Miller, R.W., Hauer, R.J. and Werner, L.P., 2015. Urban forestry: planning and managing urban greenspaces. Waveland press.

Pearlmutter, D., Calfapietra, C., Samson, R., O'Brien, L., Krajter Ostoic, S., Sanesi, G. and Alonso de Amo, R., 2017. The urban forest. Cultivating green infrastructure for people and the environment (Vol. 7, pp. 1-351). Springer.

Singh, H. ed., 2024. Urban Forests, Climate Change and Environmental Pollution: Physio-Biochemical and Molecular Perspectives to Enhance Urban Resilience. Springer Nature.

Larrieu, L., Paillet, Y., Winter, S., Bütler, R., Kraus, D., Krumm, F., Lachat, T., Michel, A.K., Regnery, B. and Vandekerkhove, K., 2018. Tree related microhabitats in temperate and Mediterranean European forests: A hierarchical typology for inventory standardization. Ecological Indicators, 84, pp.194-207.

Laux, M., Lv, H., Entling, M.H., Schirmel, J., Narang, A., Köhler, M. and Saha, S., 2022. Native pedunculate oaks support more biodiversity than non-native oaks, but non-native oaks are healthier than native oaks: A study on street and park trees of a city. Science of The Total Environment, 853, p.158603.

Larcher, W., 2003. Physiological plant ecology: ecophysiology and stress physiology of functional groups. Springer Science & Business Media.
Cueva, J., Yakouchenkova, I.A., Fröhlich, K., Dermann, A.F., Dermann, F., Köhler, M., Grossmann, J., Meier, W., Bauhus, J., Schröder, D. and Sardemann, G., 2022. Synergies and trade-offs in ecosystem services from urban and peri-urban forests and their implication to sustainable city design and planning. Sustainable Cities and Society, 82, p.103903.

Base For
This module can be valuable for students interested in learning about city trees and their significance in human health, ecosystem health, resilience, and biodiversity. It can also benefit students seeking careers in organizations focused on biodiversity and ecological issues, aiming to develop teaching skills, or pursuing advanced studies in ecology.

M 8.57 Module: Research Module: Epigenetics (M7201) [M-CHEMBIO-105669]

Coordinators: Prof. Dr. Sylvia Erhardt
Organisation: KIT Department of Chemistry and Biosciences
Part of: Genetics (Compulsory Elective Subject - Research)
Zoology (Compulsory Elective Subject - Research)
Molecular Biology (Compulsory Elective Subject - Research)
Cell Biology (Compulsory Elective Subject - Research)
Life Science Engineering (Compulsory Elective Subject - Research)

Credits	Grading	Duration	Language	Level	Version
8 CP	graded	1 term	English	4	1

Mandatory			
T-CHEMBIO-111322	Epigenetics	8 CP	Erhardt

Assessment
The performance assessment is a **different type of examination.**

Part of the performance assessment takes the form of a 120-minute written test on the lecture and the content of the practical course. This part of the examination can be used to achieve 80 points of the total number of points. In addition to this written test, a report on the internship must be prepared, which must meet scientific standards. This report can earn 10 points. Furthermore, the work of the internship must be presented within the working group as a poster or lecture. 10 points can also be earned for this part.

Competence Goal
They should achieve the following learning objectives

- Basic understanding of epigenetics and chromatin biology.
- You will be able to carry out molecular and cell biology research with transgenic Drosophila melanogaster and/or culture cells in basic research.
- You will acquire methods to specifically generate and analyze expression changes.
- You will be able to understand and interpret the results of these experiments.
- You will be able to present and discuss theoretical and practical details of these experiments orally and in writing in English.

Content
The module aims to provide an in-depth insight into current research directions in epigenetics. Various aspects of epigenetics, epitranscriptomics and chromatin biology will be discussed. Novel methods for analyzing epigenetic phenomena will also be discussed on the basis of current research questions. The participating students will be introduced to current techniques and questions by means of experiments that include current research focuses of the chair. Experiments will be carried out, evaluated and interpreted independently under supervision. This also includes the theoretical follow-up of the experiments and the writing of a detailed protocol.

Additional Information
A large part of the internship is held in English

Workload
Attendance time:

- Lecture: 15 h; 1 SWS; 1 CP
- Practical course: 90 h; 6 SWS; 7 LP

Preparation and follow-up time:

- Lecture: 15 h
- Practical course: 120 h

Teaching and Learning Methods
Lecture, practical course, presentation

Literature

- Paro, Grossniklaus, Santoro: Introduction to Epigenetics (open access) Springer. ISBN 978-3-030-68669-7, available April 2021
- Nordheim, Knippers et al: Molecular Genetics ISBN 9783132426375
- Duffy JB: GAL4 system in Drosophila: a fly geneticist's Swiss army knife DOI: 10.1002/gene.10150
- Martire, Banaszynki: The roles of histone variants in fine-tuning chromatin organization and function https://www.nature.com/articles/s41580-020-0262-8

M 8.58 Module: Research Module: Genetics and Protein Chemistry (M7201) [M-CHEMBIO-100269]

Coordinators: Prof. Dr. Anne Ulrich
Organisation: KIT Department of Chemistry and Biosciences
Part of: Biochemistry (Compulsory Elective Subject - Research)
Life Science Engineering (Compulsory Elective Subject - Research)

Credits	Grading	Recurrence	Duration	Language	Level	Version
8 CP	graded	Each summer term	1 term	German	4	1

Mandatory			
T-CHEMBIO-100515	Biochemistry II - Genetics (Lecture)	1 CP	Ulrich
T-CHEMBIO-100516	Biochemistry - Genetics, Protein Chemical Methods (Practical Research Course)	7 CP	

Competence Goal
After completing the module, students will be able to apply their specialist knowledge and modern biochemistry methods to simple scientific questions, as they will have acquired a broad knowledge of the structure and function of proteins, lipids, carbohydrates and nucleic acids in the two lectures and the subsequent practical course. They know the mechanisms of enzymatic reactions and how these are regulated. They know how biomembranes are composed and how signals and substances are transported through them. They know the different strategies a cell can use to generate energy and are familiar with the metabolic pathways of sugars, fats and amino acids. They have developed an understanding of how genes are read to produce proteins and how this process can be regulated and influenced both in the organism and in the laboratory. They will then be able to apply this specialist and methodological knowledge to questions of protein research (cloning of genes and expression, purification and characterization of proteins) and the characterization of enzymes (enzyme kinetics) during the practical course. They are able to evaluate and interpret the data obtained in the experiments and then present and discuss them controversially in German or English during the seminar accompanying the practical course, taking into account the specialist literature.

Content
Biochemistry of carbohydrates and nucleic acidsCarbohydrates: glycolysis, citrate cycle, respiratory chain, gluconeogenesisMetabolism of fatty acids, urea cycleNucleic acids: transcription, translation, protein biosynthesisDNA replication, genetic engineering

Literature

- Müller-Esterl "Biochemistry - An introduction for physicians and scientists"
- Stryer "Biochemistry"
- Voet/Voet/Pratt "Textbook of Biochemistry" (Ed. Beck-Sickinger & Hahn,Wiley-CH)Munk
- "Biochemistry, Cell Biology, Ecology, Evolution" (Grundstudium Biologie, Spektrum Verlag)-
- Horn/Lindenmeier/Moc/Grilhösl/Berghold/Schneider/Münster "Biochemie des Menschen" (Thieme Verlag)Skri
- Script with pictures from Müller-Esterl (on biochemistry homepage)

M 8.59 Module: Research Module: Genetics of Lower Eukaryotes (M4201) [M-CHEMBIO-100224]

Coordinators: Prof. Dr. Jörg Kämper
Organisation: KIT Department of Chemistry and Biosciences
Part of: Genetics (Compulsory Elective Subject - Research)
Microbiology (Compulsory Elective Subject - Research)
Molecular Biology (Compulsory Elective Subject - Research)
Life Science Engineering (Compulsory Elective Subject - Research)

Credits	Grading	Recurrence	Duration	Language	Level	Version
8 CP	graded	Each summer term	1 term	German	4	2

Mandatory			
T-CHEMBIO-108661	Genetics of Lower Eukaryotes	8 CP	Kämper

Assessment
The control of success of this module is one marked performance of different types of examination
Maximum 100 points can be reached. These points consits the following components:

- On examination is a written part, with duration of 120 minutes, about the contents of the lecture and the practical part. With this performance 80 points can be reached.
- Beside this written test, a protocol of the practical part must be written. This protocol must be in accordance with scientific requirements.
  For this protocol 10 points can be reached.
- Furthermore, 10 points can be achieved by giving a talk about methods, techniques and subjects conveyed by the practical course.

Prerequisites
none

Competence Goal
They should achieve the following learning objectives

-Planning and execution of experiments for the modification of genomes of lower eukaryotes

-conceptual understanding of analysis methods for targeted genome modifications

-Use of programs for planning cloning, implementation of experimental designs in experiments

-molecular phenotyping of lower eukaryotes

-Application of the yeast two hybrid system (and corresponding controls) for the study of protein interactions

-Application of techniques for the expression analysis of genes and proteins

Content
Lecture:

Concepts and mechanisms of regulatory processes in lower eukaryotes(yeasts and hyphal fungi).

Mechanistic focus:

Signal perception: function of receptors; 2-component systems, signal transduction: G-proteins, cAMP; MAPK cascades, mechanisms of gene regulation: transcription factors, chromatin structure, DNA modification, complex regulatory mechanisms, systems biology.

Organismic focus:

Function of cross-type loci; cross-type switching; silencing; osmoregulation; regulation of sugar metabolism and amino acid metabolism; regulation of gene clusters

Analytical focus:

Reverse genetics; screening methods, reporter systems; tagging mutagenesis techniques; global gene expression analysis; analysis of protein interactions (two-hybrid systems, BIACORE, protein chips, methods for purification of native complexes)

Practical course:

Introduction of genetic systems for the analysis of molecular regulatory processes.

Independent planning and execution of molecular biological work with lower eukaryotes.

Transformation and targeted gene alterations in Ustilago maydis (transformation, analytical PCR and Southern analysis to verify homologous recombination events); phenotypic and molecular analysis of the effects of gene alterations (crossover assays, plant infection, RFLP analysis), analysis of protein-protein interactions in the yeast two-hybrid system (cloning of altered genes from U. maydis in yeast vectors, transformation of yeast, interaction assays); sequencing of mutated genes; sequence analysis.

Additional Information
Module cycle: SS: 1st block period

Module duration: 4 weeks, full day

Teaching and Learning Methods
Lecture, seminar, practical course

Literature
Practical course script, original literature related to the experiment

M 8.60 Module: Research Module: Introductory Course on Molecular Methods and Techniques Using Model Organisms (Propaedeutic Module) (MFOR9200) [M-CHEMBIO-107589]

Coordinators: Prof. Dr. Sylvia Erhardt
Prof. Dr. Jörg Kämper
Prof. Dr. Peter Nick

Organisation: KIT Department of Chemistry and Biosciences

Part of: Botany (Compulsory Elective Subject - Research)
Genetics (Compulsory Elective Subject - Research)
Microbiology (Compulsory Elective Subject - Research)
Zoology (Compulsory Elective Subject - Research)
Developmental Biology (Compulsory Elective Subject - Research)
Molecular Biology (Compulsory Elective Subject - Research)
Cell Biology (Compulsory Elective Subject - Research)
Biophysics (Compulsory Elective Subject - Research)
Biochemistry (Compulsory Elective Subject - Research)
Biotechnology (Compulsory Elective Subject - Research)
Technical Biology (Compulsory Elective Subject - Research)
Life Science Engineering (Compulsory Elective Subject - Research)

Credits	Grading	Recurrence	Duration	Language	Level	Version
8 CP	graded	Each winter term	1 term	English	4	1

Mandatory			
T-CHEMBIO-114864	Research Module: Introductory Course on Molecular Methods and Techniques Using Model Organisms (Propaedeutic Module)	8 CP	Erhardt, Kämper, Nick

Assessment
Success is assessed in the form of a different type of examination

A total of 100 points can be earned.

- One part of the examination takes the form of a written test lasting 80 minutes on lectures, preliminary discussions, presentations prepared by the students and the content of the internship. This part of the examination can be used to achieve 80 points of the total number of points.
- In addition to this written test, a report on the internship must be prepared, which must meet scientific standards. 10 points can be obtained for this report.
- In addition, 10 points can be earned for a presentation prepared by the student on the methods, techniques and/or content of the internship.

Competence Goal
Planned learning objectives:

- Application of methods for in vivo and in vitro recombination of nucleic acids (advanced cloning)
- Planning and execution of experiments for the targeted modification of genomes in plants, animals, lower eukaryotes and bacteria
- Conceptual understanding and application of analytical methods for targeted genome modifications
- Use of bioinformatic tools for cloning planning and transfer of theoretical experimental designs into experimental implementations
- Molecular phenotyping and functional gene analysis
- Application of molecular biological techniques for the detection and expression analysis of genes and proteins
- Application of advanced microscopic methods for the visualization of proteins or cellular structures in living cells and tissues (Advanced Microscopy)

As the module primarily serves to prepare foreign students for the Master's degree course in molecular biology, the program can be flexibly adapted to the respective level of knowledge and needs of the participants.

Additional Information
1st block

Workload
Attendance time:

- Lecture/seminars/lectures: 15 h; 1 SWS; 1 CP
- Practical course: 90 h; 6 SWS; 7 LP

Preparation and follow-up time:

- Lecture/seminars/lectures: 15 h
- Practical course: 120 h

Recommendations
This research module is particularly recommended for students who have completed their Bachelor's degree at a foreign university or at a German university with a different focus. The module can also be useful for students who would like to refresh or supplement their basic knowledge in this area. As the module was developed as part of the promotion of international students, students with a foreign university degree are given preferential admission.

Teaching and Learning Methods
Lectures, presentations, seminars, internship

M 8.61 Module: Research Module: Marine Biology on Heligoland (MFOR7204) [M-CHEMBIO-107565]

Coordinators: Dr. Gabriele Jürges
Dr. Urszula Weclawski

Organisation: KIT Department of Chemistry and Biosciences

Part of: Botany (Compulsory Elective Subject - Research)
Genetics (Compulsory Elective Subject - Research)
Zoology (Compulsory Elective Subject - Research)
Developmental Biology (Compulsory Elective Subject - Research)
Molecular Biology (Compulsory Elective Subject - Research)
Cell Biology (Compulsory Elective Subject - Research)
Taxonomy and Geoecology

Credits	Grading	Recurrence	Duration	Language	Level	Version
8 CP	graded	see Annotations	2 terms	German	4	1

Mandatory			
T-CHEMBIO-114860	Marine Biology on Heligoland (Research Practial)	8 CP	Jürges, Weclawski

Assessment
The performance assessment is a different type of examination

Written examination on the lecture (80 points)
Practical work and report (10 points)
Presentations (10 points)

Prerequisites
Successfully completed zoological and botanical identification exercises or comparable previous taxonomic knowledge. An average level of physical fitness is also required

Competence Goal
Students gain a sound insight into the marine habitats of the offshore island of Heligoland and the adjacent dune. They learn how to reliably identify key marine and insular animal and plant species and understand ecological interactions in these habitats. In addition, they are familiarized with the basic work processes at the Alfred Wegener Institute (AWI) research station. In a project-oriented research context, they acquire methodological skills in sampling, processing and analyzing biological material.

Content
Course schedule and content
The course begins in the winter semester with a weekly lecture series. This is followed in July by preparatory specialist lectures that specifically prepare students for the practical part of the course. The practical phase takes place on the offshore island of Helgoland. This is where the fieldwork is carried out, further specialist lectures on marine biology topics are held and final presentations are given. Students work in small teams of 2-3 people each.

Lecture (winter semester)
The lecture is divided into a zoological and a botanical part, introduced by an introduction to general marine biology.

The zoological part deals with various marine habitats and the special adaptations of the animal species found there to specific environmental conditions. Ecological relationships are analyzed using examples and current research results are presented. Knowledge of the diversity, ecology and habitat requirements of marine and insular animal species, with special consideration of their role in marine ecosystems, is provided.

The botanical part....

Field internship (end of summer semester, 3. block)
As part of several day excursions and practical surveys, students investigate the marine biodiversity around Heligoland - an important ecological hotspot in the North Sea.

The focus is on identifying flora and fauna, recording ecological site conditions and classifying them in higher-level ecological contexts.

Various biotope types are explored - including the rocky coast with its avifauna, the sandy beaches of the dune, the tidal zones of the rocky mudflats and sublittoral habitats, which are investigated with the research vessel or in cooperation with professional divers from the AWI.

The students work independently on ecological-taxonomic projects in small teams and present their results at a final event.

In addition to the natural diversity, Heligoland is also reflected as a man-made cultural landscape with its maritime history.

Module Grade Calculation
Written examination on the lecture (80 points)
Protocol on the practical part (10 points)
Presentations (10 points)

Additional Information
Organizational notes

The field internship takes place every two years, starting in the summer semester of 2027. Places are allocated as part of the module selection in the winter semester of the previous year.

Travel to Heligoland is organized centrally by coach. Accommodation will be in double rooms in the Mielckhaus. Meals will be organized by the participants themselves (self-catering).

Workload
Attendance time:

Lecture (12x1.5 hours) and written exam (2 hours) - 20 hours
Practical course - 90 hours

Preparation and follow-up time:

Written exam - 40 hours
Practical course - 90 hours

Teaching and Learning Methods
Lecture, practical course, field exercise, seminar, block seminar, day excursion, project work, group presentations

Literature
Hempel, Gotthilf; Hempel, Irmtraut; Schiel, Sigrid (eds.): Fascination Marine Research - An Ecological Reader. Bremen: H. M. Hauschild GmbH 2006. 464 p.

Müller, Werner A.: Lebenswelt Meer: Reportage aus der Meeresbiologie und Vorstellungen über die Entstehung des Lebens. Berlin, Heidelberg: Springer, 2016 (1st ed. 2017). IX, 255 PP. ISBN 978-3-662-52851-8.

Sommer, Ulrich: Biological oceanography. 2nd, revised ed. Berlin, Heidelberg: Springer 2005 (reprint 2016). XX, 412 PP. ISBN 978-3-662-49881-1.

M 8.62 Module: Research Module: Marine Biology on Isola del Giglio (MFOR5209) [M-CHEMBIO-107584]

Coordinators: Prof. Dr. Simone Mayer
Dr. Urszula Weclawski

Organisation: KIT Department of Chemistry and Biosciences

Part of: Botany (Compulsory Elective Subject - Research)
Genetics (Compulsory Elective Subject - Research)
Microbiology (Compulsory Elective Subject - Research)
Zoology (Compulsory Elective Subject - Research)
Developmental Biology (Compulsory Elective Subject - Research)
Molecular Biology (Compulsory Elective Subject - Research)
Cell Biology (Compulsory Elective Subject - Research)
Taxonomy and Geoecology

Credits	Grading	Recurrence	Duration	Language	Level	Version
8 CP	graded	see Annotations	2 terms	German	4	1

Mandatory			
T-CHEMBIO-114852	Marine Biology on Isola del Giglio (Research Practial)	8 CP	Mayer, Weclawski

Assessment
The performance assessment is a different type of examination

Written examination on the lecture (80 points)
Practical work and report (10 points)
Presentations (10 points)

Prerequisites
Successfully completed zoological and botanical identification exercises or comparable previous taxonomic knowledge. An average level of physical fitness is also required

Competence Goal
Students gain a sound insight into the marine habitats of the offshore island of Heligoland and the adjacent dune. They learn how to reliably identify key marine and insular animal and plant species and understand ecological interactions in these habitats. In addition, they are familiarized with the basic work processes at the Alfred Wegener Institute (AWI) research station. In a project-oriented research context, they acquire methodological skills in sampling, processing and analyzing biological material.

Content
Course schedule and content
The course begins in the winter semester with a weekly lecture series. This is followed in July by preparatory specialist lectures that specifically prepare students for the practical part of the course. The practical phase takes place on the offshore island of Helgoland. This is where the fieldwork is carried out, further specialist lectures on marine biology topics are held and final presentations are given. Students work in small teams of 2-3 people each.

Lecture (winter semester)
The lecture is divided into a zoological and a botanical part, introduced by an introduction to general marine biology.

The zoological part deals with various marine habitats and the special adaptations of the animal species found there to specific environmental conditions. Ecological relationships are analyzed using examples and current research results are presented. Knowledge of the diversity, ecology and habitat requirements of marine and insular animal species, with special consideration of their role in marine ecosystems, is provided.

The botanical part....

Field internship (end of summer semester, 3. block)
As part of several day excursions and practical surveys, students investigate the marine biodiversity around Heligoland - an important ecological hotspot in the North Sea.

The focus is on identifying flora and fauna, recording ecological site conditions and classifying them in higher-level ecological contexts.

Various biotope types are explored - including the rocky coast with its avifauna, the sandy beaches of the dune, the tidal zones of the rocky mudflats and sublittoral habitats, which are investigated with the research vessel or in cooperation with professional divers from the AWI.

The students work independently on ecological-taxonomic projects in small teams and present their results at a final event.

In addition to the natural diversity, Heligoland is also reflected as a man-made cultural landscape with its maritime history.

Additional Information
Organizational notes

The field internship takes place every two years, starting in the summer semester of 2027. Places are allocated as part of the module selection in the winter semester of the previous year.

Travel to Heligoland is organized centrally by coach. Accommodation will be in double rooms in the Mielckhaus. Meals will be organized by the participants themselves (self-catering).

Workload
Attendance time:

Lecture (12x1.5 hours) and written exam (2 hours) - 20 hours
Practical course - 90 hours

Preparation and follow-up time:

Written exam - 40 hours
Practical course - 90 hours

Teaching and Learning Methods
Lecture, practical course, field exercise, seminar

Literature
Hempel, Gotthilf; Hempel, Irmtraut; Schiel, Sigrid (eds.): Fascination Marine Research - An Ecological Reader. Bremen: H. M. Hauschild GmbH 2006. 464 p.

Müller, Werner A.: Lebenswelt Meer: Reportage aus der Meeresbiologie und Vorstellungen über die Entstehung des Lebens. Berlin, Heidelberg: Springer, 2016 (1st ed. 2017). IX, 255 PP. ISBN 978-3-662-52851-8.

Sommer, Ulrich: Biological oceanography. 2nd, revised ed. Berlin, Heidelberg: Springer 2005 (reprint 2016). XX, 412 PP. ISBN 978-3-662-49881-1.

M 8.63 Module: Research Module: Methods of Developmental Biology (M6202) [M-CHEMBIO-100251]

Coordinators: Dr. habil. Dietmar Gradl
Prof. Dr. Ferdinand le Noble

Organisation: KIT Department of Chemistry and Biosciences

Part of: Zoology (Compulsory Elective Subject - Research)
Developmental Biology (Compulsory Elective Subject - Research)
Life Science Engineering (Compulsory Elective Subject - Research)

Credits	Grading	Recurrence	Duration	Language	Level	Version
8 CP	graded	Each term	1 term	German/English	4	3

Mandatory			
T-CHEMBIO-108975	Methods of Developmental Biology	8 CP	Gradl, le Noble

Assessment
Examination of a different kind

- Success is assessed in the form of a written examination lasting 120 minutes on the lecture and the content of the practical course - 80 points
- The contents of the practical course and the results of the experiments are discussed and reviewed in a presentation - 10 points
- The results are summarized in a protocol - 10 points

Prerequisites
none

Competence Goal
Understanding the molecular mechanisms regulating early embryogenesis in vertebrates and invertebrates.

Content
•Determinantes und morphogenes
•Cleavage types
•Organization centers and induction of cell fate
•Signal transduction pathways
•Determination of body axes
•Gastrulation
•Neurulation
•Neural crest cells
•Handling of Xenopus embryos
•Comparative morphology with different histological methods, including Gryosections and microtome sections
•Staining of germ layers via in situ hybridisation and antibody staining in Xenopus, hydra, zebrafish and mouse.
•Tissue explantations
Axis induction assays

Additional Information
Module cycle:

WS: 3rd block period

SS: Block after the semester

Module duration: 4 weeks, full day

Declaration according to § 30a LHG

Information on the animals and their use.

Animals are used**in**this module. Zebrafish from the laboratory's own husbandry are mated to obtain embryos. Studies are carried out on these embryos up to an age of 5 dpf. Fin-clips of adult animals can also be produced All husbandry and procedures are approved by the responsible regional council.

Reasons why the use of animals cannot be dispensed with in this module

The development of the vertebrate vascular system is based on complex interactions between the cell types involved. Often only some of the cell types or proteins involved have been identified. Consequently, these questions cannot be fully investigated in *in vitro culture systems*because not all molecular parameters are known that would have to be reconstructed in these systems. Furthermore, the complex spatial environment into which the developing vessel grows cannot be fully simulated in culture.

Information on the courses and performance assessments to which students can alternatively switch

This is an elective course; students can alternatively take other FOR/PRO modules that do not involve working with animals.

Workload
Attendance time:

- Lecture: 15 h; 1 SWS; 1 CP
- Practical course: 90 h; 6 SWS; 7 CP

Preparation and follow-up time:

- Lecture: 15 h
- Practical course: 120 h

Teaching and Learning Methods
Lecture, seminar, practical course

Literature
•Scott F. Gilbert, Developmental Biology, 7th ed., Sinauer, 2006

•Lewis Wolpert, Entwicklungsbiologie, Spektrum Verlag, 2007

•Internetmaterialien unter http://www.zi2.uni-karlsruhe.de/hauptstudium_ss.html

M 8.64 Module: Research Module: Methods of Developmental Genetics (M3208) [M-CHEMBIO-103095]

Coordinators: Prof. Dr. Lennart Hilbert
Prof.Dr. Uwe Strähle

Organisation: KIT Department of Chemistry and Biosciences

Part of: Genetics (Compulsory Elective Subject - Research)
Zoology (Compulsory Elective Subject - Research)
Developmental Biology (Compulsory Elective Subject - Research)
Molecular Biology (Compulsory Elective Subject - Research)
Life Science Engineering (Compulsory Elective Subject - Research)

Credits	Grading	Recurrence	Duration	Language	Level	Version
8 CP	graded	Each winter term	1 term	English	4	3

Mandatory			
T-CHEMBIO-108671	Methods of Developmental Genetics	8 CP	Hilbert, Strähle

Assessment
Success is assessed in the form of a different type of examination.

- One part of the examination takes the form of a written test on the lecture and the content of the practical course. This part of the examination is worth 80 points of the total number of points.
- In addition to this written test, a report on the internship must be prepared, which must meet scientific standards. 10 points can be obtained for this report.
- A presentation must also be given. 10 points can also be earned for this part.

Prerequisites
None

Competence Goal
You are expected to achieve the following learning objectives:

- Be familiar with the early stages of embryonic development, namely embryonic genome activation and differentiation of stem cells into spatially ordered and molecularly defined tissue precursor cells (germ layers).
- You are familiar with the main processes of molecular control of early developmental stages and can explain them in the context of general mechanisms of chromatin establishment and transcriptional control.
- In the practical course, you will work with zebrafish eggs and primary cell cultures obtained from these eggs, which are used as laboratory model systems of early embryonic development. You will perform fluorescence staining, microinjections, and various methods of high-resolution fluorescence microscopy on these eggs.
- They will be able to use the different methods as well as recent original scientific literature in theory and practice to answer questions in developmental biology and cell biology
- In the form of short review lectures, you will learn the ability to communicate your results to your audience in a condensed and appealing form

Content
The Methods of Developmental Genetics module focuses on the range of methods for developmental biology and genetics, specifically in the zebrafish model system. We aim to teach you molecular biology and microscopic techniques that can be used to detect and induce changes in genome organization, transcription, and the cell cycle during development. These techniques have numerous applications in research, as well as in industrial biotechnology and medicine. We will continue to teach you how to observe phenotypes in the development of fish eggs and young larvae, which you can use to determine the effects of perturbations in transcription and its control. You will work in a team on your own project and learn how to apply the techniques practically.

The course will be accompanied by lectures and seminars in which the main concepts of early embryonic development, relevant molecular biology and genetic methods and tools and their application, as well as work on primary literature will be covered in more depth.

Workload
Attendance time:

- Lecture: 15 h; 1 SWS; 1 LP
- Practical course: 90 h; 6 SWS; 7 LP

Preparation and wrap-up time:

- Lecture: 15 h
- Practical course: 120 h

Teaching and Learning Methods
Lecture and practical course

M 8.65 Module: Research Module: Microbiology of Eukaryotes (M4206) [M-CHEMBIO-100225]

Coordinators: Prof. Dr. Reinhard Fischer
Dr. Maria Cristina Stroe

Organisation: KIT Department of Chemistry and Biosciences

Part of: Genetics (Compulsory Elective Subject - Research)
Microbiology (Compulsory Elective Subject - Research)
Molecular Biology (Compulsory Elective Subject - Research)
Cell Biology (Compulsory Elective Subject - Research)
Life Science Engineering (Compulsory Elective Subject - Research)

Credits	Grading	Recurrence	Duration	Language	Level	Version
8 CP	graded	Each winter term	1 term	English	4	3

Mandatory			
T-CHEMBIO-108663	Microbiology of Eukaryotes	8 CP	Fischer, Stroe

Assessment
A total of 100 points can be achieved in the other type of examination. These are made up as follows:

- A written part (duration: 120 minutes) on the contents of the lecture and the practical course - max. 80 points
- Participation in the practical course and the corresponding report - max. 10 points
- A lecture or presentation - max. 10 points

Prerequisites
none

Competence Goal
They should achieve the following learning objectives

-deepen the conceptual discussion for the chosen area

-read original literature and practise evaluating it critically

-carry out a research project lasting approximately four weeks

-Practice and deepen all aspects of scientific work and documentation

-You develop fluency in teamwork and practice organizing yourself

-practise presenting clearly, comprehensibly and scientifically

-You will practise being fluent and confident in an international context

Content
In this course we deal with applied aspects of molecular mycology. Fungi play a major role in food and modern biotechnology. We will learn methods for analyzing secondary metabolism and isolating exoenzymes.

Topics of the accompanying lecture:

-Molecular biology of fungi

-Developmental biology

-molecular biology of light regulation in fungi

-Circadian rhythms

-Secondary metabolites - Toxins and antibiotics

-Biotechnology - Fungi as cell factories

Topics of the practical part

Diversity of fungi: Isolation and molecular characterization

Investigation of the light dependence of sterigmatocystin and penicillin synthesis in A. nidulans and alternariol formation in Alternaria alternata (thin-layer chromatography, HPLC and inhibition test)

Investigation of the light induction of a gene using a reporter

Detection of the binding of light regulators to the promoters of light-regulated genes

Isolation of a laccase from a basidiomycete using FPLC

Use of the enzyme in a biological fuel cell

Additional Information
Module cycle: WS: 3rd block period

Module duration: 4 weeks, full day

Workload
Attendance time:

- Lecture: 15 h; 1 SWS; 1 CP
- Practical course: 90 h; 6 SWS; 7 LP

Preparation and follow-up time:

- Lecture: 15 h
- Practical course: 120 h

Recommendations
M4202

Teaching and Learning Methods
Lecture, seminar, practical course

Literature
Textbook "General Microbiology", Ed. Munk, Thieme Verlag, chapter "Fungi"

Papers on secondary metabolites and laccase from the working group (can be downloaded here: http://www.iab.kit.edu/microbio/490.php)

M 8.66 Module: Research Module: Molecular and Cell Biology of Mycorrhiza (M2207) [M-CHEMBIO-100200]

Coordinators: Prof. Dr. Natalia Requena Sanchez
Organisation: KIT Department of Chemistry and Biosciences
Part of: Botany (Compulsory Elective Subject - Research)
Genetics (Compulsory Elective Subject - Research)
Microbiology (Compulsory Elective Subject - Research)
Molecular Biology (Compulsory Elective Subject - Research)
Cell Biology (Compulsory Elective Subject - Research)
Biotechnology (Compulsory Elective Subject - Research)
Life Science Engineering (Compulsory Elective Subject - Research)

Credits	Grading	Recurrence	Duration	Language	Level	Version
8 CP	graded	Each summer term	1 term	English	4	2

Mandatory			
T-CHEMBIO-108653	Molecular and Cell Biology of Mycorrhiza	8 CP	Requena Sanchez

Assessment
The control of success of this module is one marked performance of different types of examination
Maximum 100 points can be reached. These points consits the following components:

- On examination is a written part, with duration of 120 minutes, about the contents of the lecture and the practical part. With this performance 90 points can be reached.
- Beside this written test, a protocol of the practical part must be written. This protocol must be in accordance with scientific requirements.
  For this protocol 10 points can be reached.

Prerequisites
none

Competence Goal
The following teaching goals are supposed to be reached:

•You will achieve a full understanding of the molecular and cellular mechanisms underlying the symbiotic interaction between arbuscular mycorrhizal fungi and their host plants.

•You will be able to carry out experiment in order to manipulate plant or fungal genes to analyze their putative role in the symbiosis

•You will be able to plan and carry out complex molecular biological experiments involving arbuscular mycorrhizal fungi and plants.

Content
The majority of plants in the terrestrial ecosystem (80%) are colonized by arbuscular mycorrhizal fungi. They are key to the plants to grow under poor nutrient conditions and thus are key for the sustainability of plant growth and future agricultural programs. However, these symbiotic microorganisms are still a mystery in many aspects given their complex biology. The modern biological methods have allowed us to know much more of them and provided tools to manipulate the symbiosis. In this couse, the following related topics will be extensively studied:

•Plant reprogramming during mycorrhiza symbiosis: from the cellular to the molecular level

•Molecular analysis of nutrient exhange between symbionts

•Secretion and function of mycorrhizal fungal effectors in plant cells

Teaching and Learning Methods
Lecture, seminar, practical course

Literature
Lecture slides and original key articles will be given during the course.

See also: http://www.iab.kit.edu/heisenberg/Publications.php

M 8.67 Module: Research Module: Molecular Biology of the Cell (M5208) [M-CHEMBIO-103530]

Coordinators: Prof. Dr. Martin Bastmeyer
Dr. Joachim Bentrop

Organisation: KIT Department of Chemistry and Biosciences

Part of: Zoology (Compulsory Elective Subject - Research)
Developmental Biology (Compulsory Elective Subject - Research)
Molecular Biology (Compulsory Elective Subject - Research)
Cell Biology (Compulsory Elective Subject - Research)
Biophysics (Compulsory Elective Subject - Research)
Life Science Engineering (Compulsory Elective Subject - Research)

Credits	Grading	Recurrence	Duration	Language	Level	Version
8 CP	graded	Each winter term	1 term	German/English	4	5

Mandatory			
T-CHEMBIO-107046	Molecular Biology of the Cell	8 CP	

Assessment
Success is assessed in the form of a different type of examination.
A total of 100 points can be earned.

- The first part of the examination is a 120-minute written test on the lecture and the content of the practical course. Up to 80 points can be achieved in this part of the examination.
- In addition to this written test, a report on the internship must be prepared, which must meet scientific standards. Up to 10 points are awarded for this report.
- A presentation must also be given. 10 points can also be earned for this part.

Prerequisites
none

Competence Goal
The students

-learn and understand essential content in the field of cell biology,

-are able to comprehend and master current experimental methods in cell biology,

-read original scientific literature and are able to evaluate it critically,

-develop and solve scientific problems in a team,

-document the motivation, execution and results of their experiment in a protocol and analyze or discuss them on a scientific basis

-are able to present their results clearly, confidently and in an appealing form.

Content
Lecture:

In the lecture, conceptual contents from cell biology and current focal points in cell biology research are presented.

Contents:

-Structure, function, regulation and dynamics of the cytoskeleton

-Cellular receptors and extracellular matrix

-Molecular building blocks and function of focal contacts

-Signal transduction

-Cell polarization and cell migration

-Cell mechanics / mechanobiology

-Biofunctionalized surfaces in research and regenerative medicine

Practical course:

Students work in teams to carry out small scientific projects based on current research topics. For this purpose, they read original scientific literature, write a final report in the form of a short scientific publication and present their project in an oral presentation.

-Possible focus areas:

-Cell culture (permanent, stem cell or primary cell culture) and sterile work

-Production of structured growth substrates

-biofunctionalization of surfaces

-Cell adhesion, migration and differentiation on artificial substrates

-Cellular manipulation by transfection or pharmacological inhibition

-Immunohistochemical staining of cell cultures

-Living cell microscopy, epifluorescence microscopy, high-resolution microscopy

-Quantitative image analysis

Additional Information
Module cycle: WS; 2nd block period

Module duration: 4 weeks, full-time

Workload
Attendance time:

- Lecture: 15 h; 1 SWS; 1 CP
- Practical course: 90 h; 6 SWS; 7 LP

Preparation and follow-up time:

- Lecture: 15 h
- Practical course: 120 h

Teaching and Learning Methods
Lecture, seminar, practical course

Literature
Lecture notes

Alberts et al.: Molecular Biology of the Cell

Lodish et al: Molecular Cell Biology

Pollard: Cell Biology

M 8.68 Module: Research Module: Molecular Cell Biology (M6201) [M-CHEMBIO-100226]

Coordinators: Dr. habil. Dietmar Gradl
Prof. Dr. Ferdinand le Noble

Organisation: KIT Department of Chemistry and Biosciences

Part of: Genetics (Compulsory Elective Subject - Research)
Developmental Biology (Compulsory Elective Subject - Research)
Molecular Biology (Compulsory Elective Subject - Research)
Cell Biology (Compulsory Elective Subject - Research)
Biophysics (Compulsory Elective Subject - Research)

Credits	Grading	Recurrence	Duration	Language	Level	Version
8 CP	graded	Each term	1 term	German/English	4	3

Mandatory			
T-CHEMBIO-108664	Molecular Cell Biology	8 CP	Gradl, le Noble

Assessment
Examination of a different kind

- Success is assessed in the form of a written examination lasting 120 minutes on the lecture and the content of the practical course - 80 points
- The contents of the practical course and the results of the experiments are discussed and reviewed in a presentation - 10 points
- The results are summarized in a protocol - 10 points

Prerequisites
none

Competence Goal
Cell culture as model system to understand complex processes including cell adhesion, cell migration, protein trafficking and gene regulation.

Content

- Introduction of proteins with dual-localization
- Properties of tumor cells (cell cycle, migration...)
- Signal transduction pathways
- Vasculogenesis induced by tumor cells
- Stem cells
- Organoids
- Passage of tissue culture cells
- Transfection methods
- Recombinant expression of proteins in eucaryotic cells
- Live imaging
- Reporter gene analyses
- Adhesion- and migration assays
- Immuno fluorescence analyses

Additional Information
Module cycle:

WS: 3rd block period

SS: Block after the semester

Module duration: 4 weeks, full day

Workload
Attendance time:

- Lecture: 15 h; 1 SWS; 1 CP
- Practical course: 90 h; 6 SWS; 7 CP

Preparation and follow-up time:

- Lecture: 15 h
- Practical course: 120 h

Teaching and Learning Methods
Lecture, seminar, practical course

Literature

- Alberts et al., Molekularbiologie der Zelle, Wiley, VCH
- Pollar & Earnshaw, Saunders
- Internetmaterialien unter http://www.zi2.uni-karlsruhe.de/hauptstudium_ss.html

und http://www.zi2.uni-karlsruhe.de/forschung.html

M 8.69 Module: Research Module: Molecular Plant-Microbe Interactions (M2208) [M-CHEMBIO-100201]

Coordinators: Prof. Dr. Natalia Requena Sanchez
Organisation: KIT Department of Chemistry and Biosciences
Part of: Botany (Compulsory Elective Subject - Research)
Genetics (Compulsory Elective Subject - Research)
Microbiology (Compulsory Elective Subject - Research)
Molecular Biology (Compulsory Elective Subject - Research)
Biotechnology (Compulsory Elective Subject - Research)
Life Science Engineering (Compulsory Elective Subject - Research)

Credits	Grading	Recurrence	Duration	Language	Level	Version
8 CP	graded	Each winter term	1 term	English	4	3

Mandatory			
T-CHEMBIO-108654	Molecular Plant-Microbe Interactions	8 CP	Requena Sanchez

Assessment
Success is assessed in the form of a different type of examination
A total of 100 points can be earned.

- One part of the examination takes the form of a 120-minute written test on the lecture and the content of the practical course. This part of the examination can be used to achieve 80 points of the total number of points.
- In addition to this written test, a report on the internship must be prepared, which must meet scientific standards. 10 points can be obtained for this report.
- A presentation must also be given. 10 points can also be earned for this part.

Prerequisites
none

Competence Goal
The following teaching goals are supposed to be reached:

•You will get acquired with the basic knowledge of plant-microbial interactions, the mechanisms of plant colonization, avoidance of plant defenses, and feeding on plants. Similarly, you will learn how plant organize their defense responses towards microbes and which molecular and biochemical mechanisms are involved.

•You will get extensive knowledge in three type of model interactions and the molecular mechanisms governing them.

•You will learn how to transform plant roots and to express reporter constructs to analyze microbial interactions in this organ.

•You will be able to plan and carry out complex molecular biological experiments involving microbes and plants.

Content
•Introduction, Concepts and Definitions

•Recognition and Plant-Microbe Specificity

•Mechanisms of Plant Disease Resistance

•Bacterial and Fungal Pathogenicity/Symbiosis

•Agrobacterium-Plant Interaction

•Magnaporthe grisea and Xanthomonas spp. as model pathogenic microorganisms

•Arbuscular Mycorrhizal Fungi: model symbiotic fungi

•Hot topics

Additional Information
Module cycle: WS: 1st block period

Module duration: 4 weeks, full day

Workload
Attendance time:

- Lecture: 15 h; 1 SWS; 1 CP
- Practical course: 90 h; 6 SWS; 7 LP

Preparation and follow-up time:

- Lecture: 15 h
- Practical course: 120 h

Teaching and Learning Methods
Lecture, seminar, practical course

Literature
Molecular Biology and Biochemistry of Plants (Buchanan)

And review articles of the group http://www.iab.kit.edu/heisenberg/Publications.php

Base For
Project modules 2307 and 2308

M 8.70 Module: Research Module: Pathophysiology, Molecular Basis of Diseases (M6205) [M-CHEMBIO-103501]

Coordinators: Prof. Dr. Ferdinand le Noble
Organisation: KIT Department of Chemistry and Biosciences
Part of: Genetics (Compulsory Elective Subject - Research)
Zoology (Compulsory Elective Subject - Research)
Developmental Biology (Compulsory Elective Subject - Research)
Molecular Biology (Compulsory Elective Subject - Research)
Cell Biology (Compulsory Elective Subject - Research)
Life Science Engineering (Compulsory Elective Subject - Research)

Credits	Grading	Recurrence	Duration	Language	Level	Version
8 CP	graded	Each term	1 term	German/English	4	4

Mandatory			
T-CHEMBIO-106980	Pathophysiology, Molecular Basis of Diseases	8 CP	Gradl, le Noble

Assessment
Examination of a different kind

- Success is assessed in the form of a written examination lasting 120 minutes on the lecture and the content of the practical course - 80 points
- The contents of the practical course and the results of the experiments are discussed and reviewed in a presentation - 10 points
- The results are summarized in a protocol - 10 points

Prerequisites
none

Competence Goal
Cardiovascular diseases such as heart attacks are, together with cancer, the most common cause of death in the western hemisphere. In many of these diseases, signaling cascades of embryonic growth factors are activated.

A fundamental understanding of molecular mechanisms of organogenesis and cardiovascular development will help in the development of new therapeutic approaches to treat these devastating diseases.

This module provides an insight into how developments in basic research can inform the development of new therapeutic strategies to treat patients

Content

- Introduction to Pathophysiology models for hypertension, diabetes, heart infarct-stroke-PAVD, cancer
- Introduction in the basic principles of cardiovascular development
- Physiology of the cardiovascular system (heart, vessels, kidney)
- Therapeutic strategies in ischemic cardiovascular disease
- Therapeutic strategies in cancer related disease
- Signaling cascades (including Vegf, Notch, Wnt, Bmp)
- Germ layer determination (including EMT)
- (Cardio) vascular stem cells
- Neuro-Vascular Interactions (differentiation/growth)
- Rare diseases
- Analysis of Cardiovascular development in model system (zebrafish, chicken embryo, mouse)
- Gene editing in zebrafish
- Introduction CrisprCas usage in zebrafish
- Standard molecular biology & biochemistry: PCR, cloning, Western blot
- Analysis of fluorescent reporter constructs
- In situ hybridization
- Live Imaging
- General histological methods

Additional Information
Period:

WS: 3rd block period
SS: Block after the semester

This course can serve as a basic introduction to understanding how medical research is conducted. Starting from understanding the principles of molecular cell biology to implementation approaches in the clinic. Modern medical approaches, including personalized medicine, are based on the discoveries of basic scientists.

Declaration according to § 30a LHG

Information on animals and their use.

Animals are used**in**this module. Zebrafish from the laboratory's own husbandry are mated to obtain embryos. Studies are carried out on these embryos up to an age of 5 dpf. Fin-clips of adult animals can also be produced All husbandry and interventions are approved by the responsible regional council.

Reasons why the use of animals cannot be dispensed with in this module

The development of the vertebrate vascular system is based on complex interactions between the cell types involved. Often only some of the cell types or proteins involved have been identified. Consequently, these questions cannot be fully investigated in *in vitro culture systems*because not all molecular parameters are known that would have to be reconstructed in these systems. Furthermore, the complex spatial environment into which the developing vessel grows cannot be fully simulated in culture.

Information on the courses and performance assessments to which students can alternatively switch

This is an elective course; students can alternatively take other FOR/PRO modules that do not involve working with animals.

Workload
Attendance time:

- Lecture: 15 h; 1 SWS; 1 CP
- Practical course: 90 h; 6 SWS; 7 CP

Preparation and follow-up time:

- Lecture: 15 h
- Practical course: 120 h

Teaching and Learning Methods
Lecture, Practical Course, Seminar

Literature

- Scott F. Gilbert, Developmental Biology, 7th ed., Sinauer, 2006
- Guyton & Hall: Textbook of Medical Physiology. 12th edition, 2011 (Saunders, Elsevier).
- Internetmaterialien unter http://www.zi2.uni-karlsruhe.de/hauptstudium_ss.html

M 8.71 Module: Research Module: Phenomics and Chemomics (M3209) [M-CHEMBIO-103298]

Coordinators: Dr. Thomas Dickmeis
Dr. Sepand Rastegar

Organisation: KIT Department of Chemistry and Biosciences

Part of: Genetics (Compulsory Elective Subject - Research)
Zoology (Compulsory Elective Subject - Research)
Molecular Biology (Compulsory Elective Subject - Research)
Biochemistry (Compulsory Elective Subject - Research)
Biotechnology (Compulsory Elective Subject - Research)
Life Science Engineering (Compulsory Elective Subject - Research)

Credits	Grading	Recurrence	Duration	Language	Level	Version
8 CP	graded	Each summer term	1 term	English	4	2

Mandatory			
T-CHEMBIO-108673	Phenomics and Chemomics	8 CP	Strähle

Assessment
The examination consists of two different exam components

- In the first course part, handling of zebrafish for experimental purposes will be taught. This one week-long course part will be closed with a written test.
- Subsequently, knowledge on high-throughput methods in phenotyping and chemical screening will be acquired by introductory lectures as well as practical experimental work. Topics include: analysis of the transcriptome, the metabolome, the chemome, small molecule screens, genetic screens, high-throughput microscopy and robotics,and behvioural analysis (photomotor response, swimming behaviour etc.). This 3 weeks-long part of the course will be closed with a second written test. The final mark will be composed from the marks obtained in the two course exams (25 and 75%, respectively).

Prerequisites
none

Content
In this course you will learn how to conduct chemical in vivo screens in the zebrafish model system. Equally, you will be introduced to selected methods for follow-up analysis of such screens, including OMICS-type methods.

Already one week before the actual start of the course, you will receive a set of tasks to prepare you for the course. In the first part of the course, you will then receive a small chemical library and test the effects of these compounds on various aspects of zebrafish biology, such as embryonic development, escape response behavior, and the hormone system.

In the second part of the course, you will further characterize the effects caused by some of the library compounds and thereby become acquainted with methods typically used in the zebrafish model system. As it will sometimes be necessary to understand changes in gene expression on a global level to understand how a compound affects the phenotype of an organism, we will also introduce you to the theory behind Next Generation Sequencing (NGS) techniques. In the last part of the course, you will learn how to use R, a program environment for statistical data analysis, and apply it to selected problems relevant to the techniques and concepts examined in the first parts of the course, such as analyzing behavior assay results or evaluating statistical differences between large sets of gene expression data.

To fill experimental breaks, we will both give lectures and listen to your presentations of selected literature that provides deeper insights into some special aspects of chemical screening and the zebrafish model. Also, at selected times during the course, we will take a step back from the experimental and theoretical focus of the course and look at science in its broader context within our society. You will present and discuss papers from the “Science and Society” section of the journal EMBO reports, dealing for example with questions such as advantages and disadvantages of pre-print publishing, research with human embryos, the role prizes and awards play in science etc.

The course ends with a written exam on Friday of the last week.

Teaching and Learning Methods
Vorlesung, Practical Course, Seminar

M 8.72 Module: Research Module: Photoreceptors in Plants and Microorganisms (M1205) [M-CHEMBIO-100195]

Coordinators: Prof. Dr. Tilman Lamparter
Organisation: KIT Department of Chemistry and Biosciences
Part of: Microbiology (Compulsory Elective Subject - Research)

Credits	Grading	Recurrence	Duration	Language	Level	Version
8 CP	graded	Each winter term	1 term	German	4	2

Mandatory			
T-CHEMBIO-108618	Photoreceptors in Plants and Microorganisms	8 CP	Lamparter

Assessment
Written examination with a duration of 120 minutes

Prerequisites
none

Competence Goal
The following teaching goals are supposed to be reached:

•Dealing with photometers and fluorometers

•What is a chromophore ?

•Learning protein techniques such as recombinant expression, chromatography, SDS -PAGE , Western Blot

•Preparing media and buffers

•Understanding of the operation of photoreceptors

•Overview of different photoreceptors

•Optogenetics

Content
We will perform biochemical studies on photolyases and phytochrome from Agrobacterium tumefaciens and plants. Experiments will deal e.g. with light-induced conformational changes of the protein. These photoreceptors are recombinantly expressed and purified by affinity chromatography. Site-directed mutagenesis might be performed to determine the function of individual amino acids. The biological action of phytochrome in plants and Agrobacterium are also investigated.

M 8.73 Module: Research Module: Plant Cell Biology (M1201) [M-CHEMBIO-100191]

Coordinators: Prof. Dr. Peter Nick
Organisation: KIT Department of Chemistry and Biosciences
Part of: Botany (Compulsory Elective Subject - Research)
Developmental Biology (Compulsory Elective Subject - Research)
Molecular Biology (Compulsory Elective Subject - Research)
Cell Biology (Compulsory Elective Subject - Research)
Life Science Engineering (Compulsory Elective Subject - Research)

Credits	Grading	Recurrence	Duration	Language	Level	Version
8 CP	graded	Each term	1 term	English	4	2

Mandatory			
T-CHEMBIO-108615	Plant Cell Biology	8 CP	Nick

Assessment
The performance review takes place in the form of an examination performance of a different kind
A total of 120 points can be acquired. These are composed of

- a written test of 120 minutes on contents of the lecture. 60 points of the total score can be achieved with this test.
- Group exercises (individual input via Ilias). With this 18 points can be acquired.
- In-depth exercises accompanying the lectures. This allows 30 points to be earned.
- a protocol of the practical course, which must meet scientific standards. For this protocol 8 points can be earned.
- a project proposal, which must be developed according to scientific criteria. 4 points can be earned for this proposal.
- the presentation of the project in a lecture. For good presentations a grade bonus of maximum 0.3 grade levels can be earned.

Successful participation in the internship is a necessary prerequisite for completion of the module. This is documented by a countersigned acceptance protocol. Criteria for passing are regular attendance, compliance with safety regulations, documentation of experiments and data, and organization of samples according to scientific standards. In case the acceptance protocol is not accepted, the internship is considered as failed. Here, depending on the individual case, conditions are agreed upon that must be fulfilled before the examination performance can be accepted as passed.

Prerequisites
none

Competence Goal
You will be expected to achieve the following learning objectives.

-In-depth introduction to the methods and concepts of modern plant cell biology.

-Competence in the interpretation of common laboratory methods, especially fluorescence microscopy.

-Found understanding of these methods.

-Introduction to independent scientific thinking, critical use of primary and secondary literature.

-Understanding of the peculiarities of the plant cytoskeleton.

-Cellular aspects of plant development.

Content
The lecture will be given in English.

-Molecular microscopy (fundamentals of fluorescence and confocal microscopy, FRET, FRAP, quantitative image analysis, superresolution-microscopy).

-Molecular probes (GFP, immunofluorescence, artifacts and controls, novel fluorescent proteins with applications).

-Cellular manipulation (microinjection, patch-clamp, biolistics, cell sorting, enhancer trap, laser-tweezer, chemical engineering, optical engineering)

-Plant cytoskeleton (structure, functions, cell cycle, tubulin modifications, actin).

-Self-organization (cellular basis of development, totipotency, self-organization in different organisms in comparison, auxin, polarity)

Additional Information
Module rotation:

WS: 1st block
and after WS together with the bachelor preparation module approx. end of February to end of March

Module duration: 4 weeks full day

Workload
Attendance time:

- Lecture: 15 h; 1 SWS; 1 LP
- Practical course: 90 h; 6 SWS; 7 LP

Preparation and wrap-up time:

- Lecture: 15 h
- Practical course: 120 h

Recommendations
The course can be well combined with a subsequent project module in Plant Cell Biology.

Teaching and Learning Methods
Lecture, seminar, practical course

Literature
http://www.botanik.kit.edu/botzell/578.php

Base For
Project Module Plant Cell Biology, Master thesis

M 8.74 Module: Research Module: Plant Developmental Biology (MFOR1221) [M-CHEMBIO-106909]

Coordinators: Dr. Jathish Ponnu
Organisation: KIT Department of Chemistry and Biosciences
Part of: Botany (Compulsory Elective Subject - Research)
Developmental Biology (Compulsory Elective Subject - Research)

Credits	Grading	Recurrence	Duration	Language	Level	Version
8 CP	graded	Each winter term	1 term	English	4	1

Mandatory			
T-CHEMBIO-113846	Plant Developmental Biology	8 CP	Ponnu

Assessment
The course includes classroom lectures and a research module featuring hands-on laboratory experience. The research module will be conducted individually or in groups, depending on the number of participating students. The total marks for the whole course are 100, with 80 marks allocated to a 120-minute written examination based on the lectures. The remaining 20 marks can be earned from the research module (10 marks for the performance in the practical module and presentation of the results and 10 marks for the written report).

Competence Goal

- Introduction to the Methods and Concepts of Plant Developmental Biology
- Hands-on Experience and Competence in Common Laboratory Methods including confocal microscopy
- Understanding the Basis of Plant Development
- Factors Influencing Plant Development
- Introduction to Leaf Development
- Heterophylly as a Developmental and Adaptive Mechanism

Content

- Cells to organs: Concepts in organ formation
- Seed germination and development
- Plant stem cells and development
- Regulation of plant shoot architecture
- Origin of leaves and auxin as a driver of leaf development
- Molecular mechanisms of leaf development
- Evolution of leaf shapes
- Heterophylly, an extreme form of phenotypic plasticity

Module Grade Calculation
The total marks for the whole course are 100, with 80 marks allocated to a 120-minute written examination based on the lectures. The remaining 20 marks can be earned from the research module (10 marks for the performance in the practical module and presentation of the results and 10 marks for the written report).

Additional Information
1st block

Workload
Internship: 90 h
Preparation and follow-up time: 120 h

Recommendations
A basic understanding of plant sciences would be advantageous.

Teaching and Learning Methods
Lecture and exercise

Literature
Plant Physiology and Development: Lincoln Taiz

M 8.75 Module: Research Module: Plant Evolution: Methods and Concepts (M1202) [M-CHEMBIO-100192]

Coordinators: Prof. Dr. Peter Nick
Organisation: KIT Department of Chemistry and Biosciences
Part of: Botany (Compulsory Elective Subject - Research)
Genetics (Compulsory Elective Subject - Research)
Molecular Biology (Compulsory Elective Subject - Research)
Biotechnology (Compulsory Elective Subject - Research)
Taxonomy and Geoecology

Credits	Grading	Recurrence	Duration	Language	Level	Version
8 CP	graded	Each term	1 term	English	4	4

Mandatory			
T-CHEMBIO-108616	Plant Evolution	8 CP	Nick

Assessment
Group exercise. The lectures at the beginning of the theoretical part are impulse lectures, which should help you to recall the prerequisites that you have acquired during your Bachelor's degree. This requires you to practise applying and linking this knowledge. To support you, there are task sheets that are worked on in groups after the keynote speech. If the group gets stuck, they can ask the lecturer present for help. However, the answers are then entered individually into an Ilias test (path: Faculty of Chemistry and Biosciences - current semester - BIO_MA_FOR_1202_Plant_Evolution). In total, a maximum of **3 x 5 = 15 points** can be earned, which are included in the exam result. These exercises must be completed by the end of the course.

Special Topic. Here, individual aspects of the respective topic are picked out and explored in greater depth independently. The starting point are impulse slides, which are provided along with further sources. On this basis, you have to solve a practical task and deliver a short paper, for which you can earn **3 x 5 = 15 points**, which are included in the exam result. A maximum of 3 special topics can be assessed, so you can choose from the topics. The papers can be submitted together for the group (by e-mail: peter.nick@kit.edu as pdf). These exercises must be completed by the end of the next block. Materials can be found on Ilias, the assignment can be found via the link on the lecture plan. This part must be completed by the end of the following block.

Project proposal. Before the practical part begins, each group must choose one of the topics provided, develop a research question based on the topic provided and then design (and plan in detail) their own project for this. This is documented in the form of a project proposal (maximum length 5 pages). >>>>>VORLAGE PROJECT PROPOSAL<<<<<< What is the purpose of this? Not only in research, but also in business, you have to apply for / fight for funding for your ideas and projects. Above all, you have to be clear about what you want and be able to explain it clearly to others. For this project proposal, you can earn points that will be included in the closed meeting result. The proposal can be submitted together for the group as a whole (by e-mail: peter.nick@kit.edu as a pdf). This task must be completed by the end of the following block.

Protocol. Each group must submit a group protocol for its project. Great importance is attached to correct protocol. For this protocol you can earn **12 points**, which are included in the exam result. The application can be submitted for the group as a whole (by e-mail: peter.nick@kit.edu as pdf). Deadline: by the end of December for the fall course, by the end of April for the spring course. How do you write a proper protocol? What is important? pdf. This task must be completed by the end of the following block.

Presentation. At the end of the module, the results are presented and discussed in a presentation. Duration: 20-25 min. **12 points** can be earned for this presentation, which are included in the exam result. A few tips (also criteria for the assessment): In the introduction, please present the background of the project and develop an explicit research question (for this you should use about 1/3 of the slides in total). The methods section is not about presenting the composition of the buffer, but the principle of the experiment (here it often helps to work with visualizations). In the results section, please do not slap your 235 raw data on the wall, but select important things (work by example). Make sure that pictures and graphs are labeled correctly - it is advisable to make a brief caption (if you forget to explain this in the heat of the moment). Things that are being compared should also be comparable (pay attention to this when scaling graphs). Don't get lost in details during the discussion, but try to present an explanation (working hypothesis) - preferably in graphical form, a picture is worth a thousand words. You can save yourself statements such as "you can't say anything because we've only done the experiment twice". It's clear that you won't win the Nobel Prize in a few weeks, what's more interesting is what conclusions you draw from your data. Have the courage to stand by your observations, but feel free to address critical points ("but this could also be explained by the fact that... To check this, you would have to carry out an experiment in which..."). You can also omit a final slide where you project all the source references in 10 ms. Sources, together with a half-page summary ("abstract"), are placed on the handout that you distribute to the audience.

Written exam. Duration 2 h, permitted aids: calculator, nothing else. **60 points** can be achieved (i.e. 50% of the total number of points)

Prerequisites
none

Competence Goal

- In-depth introduction to the methods and concepts of modern plant evolutionary biology.
- Competence in the interpretation of common laboratory methods.
- Thorough understanding of these methods.
- Introduction to independent scientific thinking, critical approach to primary and secondary literature.
- Understanding of the causes of plant biodiversity.
- Insight into the use of plant biodiversity.

Content
The lecture will be held in English.

- Mechanisms of plant evolution (variation, selection, speciation, species concept, coevolution)
- Cardinal points of plant evolution (multicellularity, shore leave, telomere theory, sexuality, alternation of generations, angiosperm evolution)
- Molecular phylogeny (basics, MP, NJ, ML, UPGMA, creation of trees, limitations, genetic barcoding, microsatellites, molecular authentication)
- Plant-human coevolution (biogeography, domestication, Wawilow centers, biodiversity and society, patenting, seeds as a political issue)
- Plant-pathogen coevolution (plant immunity, necrotrophy, biotrophy, effectors, application, resistance breeding and management)

Additional Information
Module cycle:

WS: Block period after the winter semester

SS: 1st block period

Module duration: 4 weeks, full day

Teaching and Learning Methods
Lecture, seminar, practical course

Literature
https://www.jkip.kit.edu/botzell/90.php

M 8.76 Module: Research Module: Plant Gene Technology - Precise Genome Engineering (M2201) [M-CHEMBIO-100198]

Coordinators: Dr. Fabienne Gehrke
Prof. Dr. Holger Puchta

Organisation: KIT Department of Chemistry and Biosciences

Part of: Botany (Compulsory Elective Subject - Research)
Genetics (Compulsory Elective Subject - Research)
Molecular Biology (Compulsory Elective Subject - Research)
Biotechnology (Compulsory Elective Subject - Research)
Life Science Engineering (Compulsory Elective Subject - Research)

Credits	Grading	Recurrence	Duration	Language	Level	Version
8 CP	graded	Each term	1 term	German/English	4	3

Mandatory			
T-CHEMBIO-108629	Plant Gene Technology - Precise Genome Engineering	8 CP	Gehrke, Puchta

Assessment
The performance review is a different type of examination

A total of 100 points can be achieved. These are made up as follows:

- A written part (duration: 120 minutes) on the contents of the lecture - max. 80 points
- Participation in the practical course and the corresponding report - max. 10 points
- A lecture or presentation - max. 10 points

Prerequisites
none

Competence Goal
The following teaching goals are supposed to be reached:

• You are able to work with transgenic plants in a molecular biology basic research setting.
• You acquire methods to generate directed changes in the genome of plants and to analyze them.
• You can employ experiments to link mutations in certain genes with changes in a plant organism.
• You are able to understand and interpret results of such experiments.
• You can present theoretical and practical details of such experiments in a written and oral manner.

Content
This module will offer an in-depth look into current research in plant molecular genetics. Aspects of DNA recombination and biotechnological applications will be discussed. Using examples from current research questions, newly developed methods to quantitatively analyse recombination mechanisms and to make targeted changes to these mechanisms will be addressed.

Through experiments related to current research of the institute, students will learn techniques and developments in modern gene technology. Guided by several supervisors, the students will carry out and analyze a number of experiments on their own. This also includes theoretical revision of the experiments and the preparation of a detailed report.

Additional Information
Module cycle:

WS: 2nd block period

SS: 3rd block period

Module duration: 4 weeks, full day

Workload
Attendance time:
- Lecture: 15 h; 1 SWS; 1 LP
- Practical course: 90 h; 6 SWS; 7 LP
Preparation and follow-up time:
- Lecture: 15 h
- Practical course: 120 h

Teaching and Learning Methods
Lecture, practical course, presentation

Literature

- Gentechnik bei Pflanzen (F. u. R. Kempken), Springer, 2012
- Lewin’s Genes XI (Krebs, Goldstein und Kilpatrick), Jones and Barlett, 2013
- Molecular Biology of the Gene (Watson et al.), Cummings, 2013
- Molekulare Genetik (Nordheim und Knippers), Thieme Verlag, 2015
- Genome und Gene (T.A. Brown), Spektrum Akademischer Verlag, 2007
- Der Experimentator: Molekularbiologie / Genomics (Mülhardt), Spektrum Akademischer Verlag, 2013
- online scripts

M 8.77 Module: Research Module: Protein Isolation and Kinetics (M7202) [M-CHEMBIO-100270]

Coordinators: Prof. Dr. Anne Ulrich
Organisation: KIT Department of Chemistry and Biosciences
Part of: Biochemistry (Compulsory Elective Subject - Research)
Life Science Engineering (Compulsory Elective Subject - Research)

Credits	Grading	Recurrence	Duration	Language	Level	Version
8 CP	graded	Each summer term	1 term	German	4	1

Mandatory			
T-CHEMBIO-100517	Biochemistry II - Protein Purification (Lecture)	1 CP	
T-CHEMBIO-100518	Biochemistry - Protein Purification, Kinetics (Practical Research Course)	7 CP	

Assessment
This module contains two parts:

- A written examination of 120 minutes is written on the contents of the lecture
- The practical course is an ungraded course achievement, a report must be prepared

Competence Goal
After completing the module, students have basic specialist knowledge in the field of chemical biology. They acquire basic knowledge of the manipulation of biological processes using chemical methods. They gain an insight into the organic synthesis of biologically active molecules such as nucleic acids, lipids, peptides and glycostructures as well as the combinatorial synthesis of small molecules and solid-phase chemistry. They acquire knowledge in the field of bioconjugation, bioorthogonal reactions and various labeling strategies for biomolecules. Furthermore, students gain insights into modern techniques in chemical biology such as various high-pressure techniques, FRET, RNAi and knockdown techniques, chemical genetics, phage display, yeast systems, pulldowns, microarrays, etc. They know how biomembranes are composed and how signals and substances are transported through them. You will be able to transfer the knowledge acquired in physical chemistry, such as thermodynamics, kinetics and spectroscopy, to biological systems

Content
"Introduction to chemical biology; fundamentals of solid phase synthesis" Peptide synthesis, DNA and RNA synthesis, oligosaccharide synthesis, chemical genetics; biologically relevant properties of small molecules; drugs, natural products; lipinski and drug delivery, lipids and membranes, DOS and BIOS, chemical bioorthogonal reactions, microarraysI: principles, production, analysis and application (DNA and protein microarrays), microarrays II: Production, analysis and application (peptide, carbohydrate and small-molecule microarrays),Site-specific labeling in macromolecules; semisynthesis, SNAP tag, FlAsH, sortase tag, halo tag, "fluorescence techniques, fluorescence polarization; TRFP; FRET, "theory of binding models, systematics of binding studies, "pulldown assays, chemical genetics, yeast-based screens, reporter genes, Yeast-2-hybrid, allele-specific chemical sensitivity, DNA-tags, chemical complementation, Y2H in proteomics, protein networks, RNAi and antisense techniques, PNA, morpholinos, cell penetration techniques for synthetic substances, antibodies, natural combinatorics, AK as tools in chemical biology & medicine; combinatorics and biomolecular biology; combinatorics and biomolecular biology; combinatorics and biomolecular biology; combinatorics and biomolecular biology; combinatorics and biomolecular biology. Medicine; combinatorics and biomolecules: AK mapping; directed evolution, phage display, miniproteins, ribozymes, aptamers, SELEX, DNA structures, basics of crosslinkers, crosslinking strategies, chemical inducers of dimerization, allele-specific inhibitors / bump-hole strategy,deleted, proteomics, activity-based protein profiling, SILAC,mutagenesis strategies, expansion of the genetic code, photoprotective groups, cagedcompounds, photoswitchable molecules

Workload

- Lecture 15 hours (1 SWS, 1 LP)
- Practical course: 105 hours attendance time (7 SWS, 7 LP)
- Preparation and follow-up time 120 hours

M 8.78 Module: Research Module: Quantitative Phenotyping in Breeding (MFOR1204) [M-CHEMBIO-106694]

Coordinators: Dr. Katja Herzog
Prof. Dr. Peter Nick

Organisation: KIT Department of Chemistry and Biosciences

Part of: Botany (Compulsory Elective Subject - Research)
Genetics (Compulsory Elective Subject - Research)
Molecular Biology (Compulsory Elective Subject - Research)
Biotechnology (Compulsory Elective Subject - Research)

Credits	Grading	Recurrence	Duration	Language	Level	Version
8 CP	graded	Each summer term	1 term	German/English	4	1

Mandatory			
T-CHEMBIO-113461	Quantitative Phenotyping in Breeding	8 CP	Herzog, Nick

Competence Goal
They should achieve the following learning objectives

- You will be familiar with various fields of application of quantitative phenotyping in different crops and model plants and their importance for basic research, breeding and precision agriculture
- You will have learned the basics and fields of application of the various sensor techniques for laboratory, greenhouse and field applications and know how to apply them yourself to practical vine breeding and breeding research issues
- They have become familiar with methods from practical breeding research and can apply these to their own search for solutions

Content

- Importance, development and potential of sensor-based high-throughput phenotyping and automated data analysis in plant breeding/breeding research, basic research, applied research including data science and data interpretation.
- Imaging and non-imaging sensors
- Satellite-, air- & ground-based platforms depending on the research questions
- Sensor techniques (3D, hyperspectral, RGB, near-infrared (NIR), laser, etc.)
- Sensor data resolution vs. recording speed
- Basics of sensor and trait data evaluation (data science), incl. data processing and modeling for the development of prediction models, genetic mapping & selection, phytopathology and evaluation of gene-phenotype-environment interactions
- Importance of databases, international standards, metadata, setting up experiments for applications in the field of artificial intelligence
- Application of the basics you have learned: you will independently collect analytical, microscopic and quantitative reference data to check the accuracy and efficiency of the various sensors used.
- The practical part comprises three focus topics: Here you will learn about three different fields of application (including data collection, evaluation (statistics with R) and data visualization) in breeding, which you can also transfer to other crops and issues:
- Week 1: Identification of new disease resistance: AI-based leaf disk assay
- Week 2: Non-destructive sensors for the prediction of analytical ingredients
- Week 3: High-throughput phenotyping - trait prediction

Changes are possible.

Additional Information
The research module takes place at the Julius Kühn Institute in Siebeldingen.

M 8.79 Module: Research Module: Resilience - Plants Conquer Land (M1203) [M-CHEMBIO-106787]

Coordinators: Dr. Gabriele Jürges
Prof. Dr. Peter Nick

Organisation: KIT Department of Chemistry and Biosciences

Part of: Botany (Compulsory Elective Subject - Research)
Microbiology (Compulsory Elective Subject - Research)
Molecular Biology (Compulsory Elective Subject - Research)
Cell Biology (Compulsory Elective Subject - Research)
Life Science Engineering (Compulsory Elective Subject - Research)

Credits	Grading	Recurrence	Duration	Language	Level	Version
8 CP	graded	Each winter term	1 term	German/English	4	2

Mandatory			
T-CHEMBIO-113638	Resilience - Plants Conquer Land	8 CP	Jürges, Nick

Assessment
Testing of a different kind

Prerequisites
Basic knowledge of botany and evolution.

Competence Goal
Students are able to recognize the most important forms of algae, early land plants and fungi (traditionally "cryptogams") and know the key features of their life cycle, structure and ecological function. They know what challenges had to be overcome when going on land and what evolutionary solutions were developed for this. They have a basic understanding of plant stress physiology and understand why knowledge of "cryptogams" is important for overcoming the challenges of climate change.

Content
Plants without flowers, their algal ancestors and their fungal companions were considered a peripheral area of plant science for decades. As they do not bear flowers and their sexuality therefore remained hidden, cryptic, they were traditionally referred to as "cryptogams". They were seen as exotic, peripheral life forms, as archaic precursors of the "real" plants. This viewpoint has since been proven ignorant - it is becoming increasingly clear that these "cryptogams" developed numerous innovations that enabled them to cope with the harsh conditions of terrestrial life long before land animals came on the scene. These innovations helped to overcome numerous stress factors such as lack of water, heat, UV stress, strong light stress or lack of nutrients. Exactly the same stress factors are now becoming relevant as a result of man-made climate change. If we understand how plants managed to colonize the land, we can use these innovations for a more sustainable and resilient agriculture. Recent years have led to new insights into the early evolution of land plants, particularly through advances in phylogenomics. To interpret these data, a thorough understanding of the diversity of non-flowering plants, the specificities of their life cycle and their physiological adaptations is needed. This is only possible if one also considers their ancestors, the various groups of algae. A deeper understanding also requires looking at the plants' companions, the fungi, without which the land journey would never have been possible. The course consists of two parts

- In the theoretical part, the different groups of "cryptogams" are presented in terms of organization, diversity, life cycle and ecological relationships. Furthermore, the evolution of early land plants and the innovations in morphology, development and physiology that made this evolution possible are presented.
- In the practical part, students practise distinguishing and identifying different life forms of algae, mosses, lichens, ferns and fungi in order to be able to deal with this diversity. This is supplemented by excursions in the surrounding area, work in the herbarium of the Natural History Museum, but also by laboratory studies using classical and modern methods of taxonomy.

Topics:

Part 1 (Gabriele Jürges): Diversity

Algae. Mosses. Fungi. Lichens. Ferns

Part 2 (Peter Nick): Shore leave

Challenges and solutions. How it really happened - from freshwater algae to gymnosperms. Evolution of stress resilience - how it was, how it will be. The explorers - algae. The helpers - fungi. The pioneers - bryophytes. The breakthrough - ferns

Module Grade Calculation
Written exam (80%), minutes (10%) and final presentation (10%)

Workload
Attendance time: Lectures 15 h, practical part 90 h. Preparation and follow-up 15 h

Recommendations
If you have not studied the Bachelor's degree at KIT, you should take another look at the Evolution section in the Fundamentals of Biology (1st semester Bachelor's degree).

Teaching and Learning Methods
Impulse lectures in the morning, followed by a practical part to practice knowledge of forms, excursions, developmental biology experiments.

Literature
Strasburger, Chapter 5
Büdel et al.: Biology of Algae, Lichens and Bryophytes, Springer Verlag

M 8.80 Module: Research Module: Seed Technology (M1204) [M-CHEMBIO-100194]

Coordinators: Prof. Dr. Peter Nick
Organisation: KIT Department of Chemistry and Biosciences
Part of: Botany (Compulsory Elective Subject - Research)
Genetics (Compulsory Elective Subject - Research)
Molecular Biology (Compulsory Elective Subject - Research)

Credits	Grading	Recurrence	Duration	Language	Level	Version
8 CP	graded	Each summer term	1 term	German	4	2

Mandatory			
T-CHEMBIO-108710	Seed Technology	8 CP	Nick

Prerequisites
none

Literature
http://www.botanik.kit.edu/botzell/581.php

M 8.81 Module: Research Module: Signal Transduction and Gene Regulation I (M3204) [M-CHEMBIO-100222]

Coordinators: Prof. Dr. Jörg Kämper
Prof. Dr. Véronique Orian-Rousseau

Organisation: KIT Department of Chemistry and Biosciences

Part of: Genetics (Compulsory Elective Subject - Research)
Molecular Biology (Compulsory Elective Subject - Research)
Cell Biology (Compulsory Elective Subject - Research)
Life Science Engineering (Compulsory Elective Subject - Research)

Credits	Grading	Recurrence	Duration	Language	Level	Version
8 CP	graded	Each winter term	1 term	German/English	4	2

Mandatory			
T-CHEMBIO-108659	Signaltransduction and Gene Regulation I	8 CP	Kämper

Assessment
The control of success takes place in the form of an examination performance of a different kind
A total of 100 points can be acquired.

- One part of the examination takes the form of a written test lasting 90 minutes, on the lecture and the contents of the internship. About this part of the examination 80 points of the total score can be achieved.
- In addition to this written test, a report on the internship must be prepared, which must meet scientific standards. For this protocol 10 points can be obtained.
- Furthermore, 10 points can be earned through a presentation prepared by the student on methods, techniques and/or contents of the internship.

Prerequisites
none

Competence Goal
Not recommended for beginning Master's students.The following learning objectives are aimed at:

-General understanding of the different regulatory concepts in signal transduction and gene regulation of prokaryotic and eukaryotic cells.

-Understand the applicability and use of various me-thods for analyzing regulatory processes.

-Authoring of scientific protocols and presentations.

Content
Lecture:

-Concepts and mechanisms of regulatory processes in prokaryotes and eukaryotes.

-control mechanisms of transcription

-Regulation of gene activity by external signals

-Signal perception: function of receptors; 2-component systems

-Signal transduction: GProteins, PKA, MAPK cascades

-Mechanisms of gene regulation: transcription factors, chromatin structure, DNA modification, complex regulatory mechanisms

-Analytical methods DNA/protein interaction (EMSA, footprint analyses)

Practical course:

Experimental part 1

Investigation of DNA-protein interactions: Overexpression and purification of a DNA-binding protein Analysis of DNA binding (Electrophoretic Mobility Shift Assay, EMSA) Determination of binding preferences (DNA bending assays).

Experimental part 2

Cellular responses to growth factors and dysregulated signaling pathways of receptor tyrosine kinases: Immunofluorescence Separation of protein mixtures and specific protein detection (SDS-PAGE, Western blot) Qualitative protein determination by Coomassie and ink staining Detection method for cell proliferation (BrdU assay).

Experimental part 3

Signal transduction and gene regulation by steroid hormone receptors in human cell lines: Determination of promoter activity by reporter gene analysis Determination of mRNA quantity by real-time PCR analysis; quantification of expression by Western blot analysis.

Additional Information
Module cycle: WS: 2nd block period

Module duration: 4 weeks, full day

The module can be taken independently of Signal Transduction and Gene Regulation II

Workload
Attendance time:

- Lecture: 15 h; 1 SWS; 1 LP
- Practical course: 90 h; 6 SWS; 7 LP

Preparation and wrap-up time:

- Lecture: 15 h
- Practical course: 120 h

Recommendations
Not recommended for Master's students at the beginning of the program.

M 8.82 Module: Research Module: Signal Transduction and Gene Regulation II (M3205) [M-CHEMBIO-100223]

Coordinators: Dr. Olivier Kassel
Organisation: KIT Department of Chemistry and Biosciences
Part of: Genetics (Compulsory Elective Subject - Research)
Molecular Biology (Compulsory Elective Subject - Research)
Cell Biology (Compulsory Elective Subject - Research)
Life Science Engineering (Compulsory Elective Subject - Research)

Credits	Grading	Recurrence	Duration	Language	Level	Version
8 CP	graded	Each summer term	1 term	English	4	2

Mandatory			
T-CHEMBIO-108660	Signaltransduction und Gene Regulation II	8 CP	Schepers

Assessment
The control of success of this module is one marked performance of different types of examination
Maximum 100 points can be reached. These points consits the following components:

- On examination is a written part, with duration of 120 minutes, about the contents of the lecture and the practical part. With this performance 90 points can be reached.
- Beside this written test, a protocol of the practical part must be written. This protocol must be in accordance with scientific requirements.
  For this protocol 10 points can be reached.

Prerequisites
none

Competence Goal
The students have an in-depth knowledge of the biology of the systems studied.

- They can also comprehend and reproduce complex relationships in the field.
- They can conduct experiments independently under guidance, can evaluate results and draw conclusions for a further procedure.
- They can evaluate the results of scientific work and discuss them by including results from the literature.
- They can present and discuss their results orally.

Content
Olivier Kassel:

Lecture:

- Skeletal muscle plasticity
- Transcriptional and translational control
- methods

Practical course:

- Cell culture, transfection
- In vitro myoblast differentiation
- SDS-PAGE/Western blot
- Myofiber growth in zebrafish embryo
- Confocal microscopy
- Optogenetics in vitro and in vivo (zebrafish)

Daniela Vallone:

Lecture:

- The endogenous circadian time-keeping mechanism
- The molecular mechanisms involved in the circadian clock entrainment and the rhythmic regulation of physiology and behavior in a vertebrate model system "the Fish"

Practical course:

- Cell culture, transfection
- Luciferase reporter assays in vivo and in vitro
- Gene expression analysis (quantitative RT-PCR, Western blotting...)

Additional Information
Module cycle: SS: 2nd block period

Module duration: 4 weeks, full day

The module can be taken independently of Signal Transduction and Gene Regulation I

Workload

- Attendance time: (Lecture, Practical coursework): 98 hours
- independent study (homework, preparation for exams, recording): 142 hours

sum: 240 hours

Teaching and Learning Methods
Lecture, seminar, practical course

Literature
Current publications and textbooks on the respective chosen practical course after consultation with the supervisors.

M 8.83 Module: Research Module: Techniques in Microscopy (M5206) [M-CHEMBIO-100248]

Coordinators: Prof. Dr. Martin Bastmeyer
Organisation: KIT Department of Chemistry and Biosciences
Part of: Zoology (Compulsory Elective Subject - Research)
Developmental Biology (Compulsory Elective Subject - Research)
Cell Biology (Compulsory Elective Subject - Research)
Biophysics (Compulsory Elective Subject - Research)
Life Science Engineering (Compulsory Elective Subject - Research)

Credits	Grading	Recurrence	Duration	Language	Level	Version
8 CP	graded	Each summer term	1 term	German	4	4

Mandatory			
T-CHEMBIO-108676	Techniques in Microscopy	8 CP	Bastmeyer, Weth

Assessment
Control of success within this module is a graded exam consisting of the folllowing parts. A maximum 100 points can be reached.

- Part one is a written exam of 120 minutes duration. It covers the contents of the lecture and of the practical course. 80 points can be acquired here.
- In addition, a protocol of the practical part must be written. This protocol has to be in accordance with scientific requirements.
  For this protocol up to 10 points can be aquired .
- Furthermore, up to 10 points can be aquired from oral knowledge checks during the during the practical couse.

Prerequisites
none

Competence Goal
They should achieve the following learning objectives

-master the geometric and wave-optical principles of image formation in the light microscope

-Understand the physical principles of fluorescent proteins and fluorescent dyes

-Understand laser scanning microscopy

-You are proficient in digital image processing

-You will master the handling of various microscopy techniques

-Understand how the technical development of microscopy techniques has influenced biological research

Content
Lecture:

The lecture introduces general principles of light microscopy and modern methods of fluorescence microscopy.

Contents:

-formation in the light microscope, optical resolution, phase contrast, interference contrast

-Sample preparation

-Theory of fluorescence microscopy

-Fluorescent dyes and fluorescent proteins

-Theory of laser scanning microscopy (LSM)

-Microscopy methods for the production of optical sections

-High-resolution microscopy (super-resolution)

-Digital cameras, photomultipliers, digital image processing

Practical course:

Students carry out small scientific projects as part of a team. They learn methods for preparing biological samples and apply various fluorescence microscopy techniques. They read original scientific literature, write a final report in the form of a short scientific publication and present their project in an oral presentation.

Focus areas:

-Immunohistochemical staining of cell cultures

-transfection with fluorescent proteins

-Wide-field fluorescence microscopy

-Laser scanning microscopy (LSM)

High-resolution microscopy (SIM, dSTORM)

-live cell imaging

-Digital image processing, 3D reconstruction, quantitative evaluation methods

Additional Information
Module cycle: SS: 3rd block period

Module duration: 4 weeks, full-time

Teaching and Learning Methods
Lecture, seminar, practical course

Literature
Alan R. Hibbs: Confocal Microscopy for Biologists, Springer Press

Rafael Yuste (Ed.): Imaging, a laboratory manual, CSH Press

James Pawley: Handbook of biological confocal microscopy, Plenum Press

M 8.84 Module: Research Module: Tissue Engineering and 3D Cell Culture (M3207) [M-CHEMBIO-101596]

Coordinators: Prof. Dr. Ute Schepers
Organisation: KIT Department of Chemistry and Biosciences
Part of: Genetics (Compulsory Elective Subject - Research)
Molecular Biology (Compulsory Elective Subject - Research)
Cell Biology (Compulsory Elective Subject - Research)
Biochemistry (Compulsory Elective Subject - Research)
Biotechnology (Compulsory Elective Subject - Research)
Life Science Engineering (Compulsory Elective Subject - Research)

Credits	Grading	Recurrence	Duration	Language	Level	Version
8 CP	graded	Each winter term	1 term	German	4	2

Mandatory			
T-CHEMBIO-108667	Tissue Engineering and 3D Cell Culture	8 CP	Schepers

Assessment
The examination is a written examination with a duration of 120 minutes
Examnined are the contents of the lecture and the practical course.

Prerequisites
None

Competence Goal
The students get an overview of the general chemical and biological basics of tissue engineering. This includes: Chemical synthesis of hydrogels for cell culture, chemical analysis of synthesized gels, basics of 2D and 3D cell culture of human cells, formation of spheroids, embedding of cells in hydrogels and microscopic analysis of the formed structures.

Content

- Techniques in 2D cell culture
- Techniques in 3D cell culture
- Formation of spheroids
- Viability assay
- Fluorescence staining
- Toxicity screening of nanoparticles on spheroids
- Microscopy/Fluorescence Microscopy
- Chemical synthesis of hydrogels for application in 3D cell culture
- Chemical characterization of hydrogels
- Physical characterization of photoinitiators for application in 3D cell culture

M 8.85 Module: Research Module: Transcriptomic Analysis (MFOR5220) [M-CHEMBIO-106907]

Coordinators: Prof. Dr. Simone Mayer
Organisation: KIT Department of Chemistry and Biosciences
Part of: Zoology (Compulsory Elective Subject - Research)
Developmental Biology (Compulsory Elective Subject - Research)
Molecular Biology (Compulsory Elective Subject - Research)
Cell Biology (Compulsory Elective Subject - Research)
Biotechnology (Compulsory Elective Subject - Research)

Credits	Grading	Recurrence	Duration	Language	Level	Version
8 CP	graded	Each winter term	1 term	English	4	2

Mandatory			
T-CHEMBIO-113843	Transcriptomic analysis	8 CP	Mayer

Assessment
Success is assessed in the form of a different type of examination.
A total of 100 points can be earned.

- One part of the examination takes the form of a written test on the lecture and the content of the practical course. This part of the examination can be used to achieve 80 points of the total number of points.
- In addition to this written test, a report on the internship must be prepared, which must meet scientific standards. 10 points can be obtained for this report.
- A presentation must also be given. 10 points can also be earned for this part.

Prerequisites
none

Competence Goal
The aim of this module is to become familiar with state-of-the-art methods, experimental design, data analysis and the conceptualization of scientific projects. Moreover, we will practice understanding scientific publications and discussing them critically in different modes of communication.

Content
This module provides an overview of the growing field of systems biology and omics approaches to answering biological questions. Specifically, we will focus on transcriptomic analysis from a theoretical and applied perspective. Students will learn to apply bioinformatics approaches to analyze transcriptome data. The course combines theoretical lectures with interactive, practical elements. Students will use the programming language R and state-of-the-art analysis frameworks such as Seurat, Bioconductor for single cell transcriptome analysis (scRNA-seq). At the end of the module, students will be able to perform and interpret scRNA-seq analyses independently and apply these skills to their own data sets or research questions. Students will also read current research papers and discuss them critically in a presentation.

Additional Information
Repeated every winter semester, 1. block
4 weeks full time

Workload
240 h

Recommendations
Book: Transcriptomics in Health and Disease, edited by G. Passos https://link.springer.com/book/10.1007/978-3-030-87821-4

Teaching and Learning Methods
Lecture, seminar, practical course

Base For
Research module - Advanced Transcriptomic Analysis

M 8.86 Module: Research Module: Vegetation and Landscape Development of Baden-Württemberg (MFOR1210) [M-CHEMBIO-107557]

Coordinators: Maren Riemann
Organisation: KIT Department of Chemistry and Biosciences
Part of: Botany (Compulsory Elective Subject - Research)
Genetics (Compulsory Elective Subject - Research)
Microbiology (Compulsory Elective Subject - Research)
Zoology (Compulsory Elective Subject - Research)
Developmental Biology (Compulsory Elective Subject - Research)
Molecular Biology (Compulsory Elective Subject - Research)
Cell Biology (Compulsory Elective Subject - Research)
Taxonomy and Geoecology

Credits	Grading	Duration	Language	Level	Version
8 CP	graded	2 terms	German/English	4	1

Mandatory			
T-CHEMBIO-114812	Vegetation and Landscape Development of Baden-Württemberg	8 CP	Riemann

Assessment
The performance assessment is a different type of examination (for details see partial performance)

Prerequisites
Prerequisite is successful completion of a module on plant identification

Competence Goal
Students are able to recognize the most important types of vegetation in Baden-Württemberg in the field and assess them in a historical context. They are able to apply simple vegetation science methods and understand essential site-ecological relationships.

Content
Lecture
(WS from January to February)

1. landscape development

- Ice ages on the Upper Rhine
- Historical forest life in the Black Forest
- Historical life in the Upper Rhine lowlands
- Methods of vegetation history research

2. plant communities of Baden-Württemberg

- Water bodies
- Terrestrial morphological biotope types
- Low-wooded terrestrial and semi-terrestrial biotope types
- Woody stands and shrubs
- Forests

3. nature and nature conservation

- Nature conservation laws (federal nature conservation, FFH directives, EC species protection regulation, federal species protection regulation, red lists)
- Landscape planning
- Practical nature conservation and its limits

7. climate change in the region

Practical course:
(2nd block of the SS)

During various excursions and practical vegetation surveys, you will get to know interesting biotope types and biodiversity hotspots in Baden-Württemberg. Special attention will be paid to the site conditions of the flora. You will get to know extreme and impressive plant habitats from the Rhine floodplains to the heights of the Black Forest.
We also look at the development of vegetation in a historical context. The field practicals will also show us the drastic effects of climate change and urban sprawl. Furthermore, you will learn how to use digital mapping methods and professional vegetation surveys.
During the mapping, special attention will be paid to the identification of grass species (Poales).

Module Grade Calculation
consists of a written part of the lecture (80%; 40 points) and the final presentation (20%; 10 points) (for details see partial performance)

Additional Information
Lecture: from 09.01.2026 to 20.02.2026 on Fridays 08:00-09:30.
The lecture is also a pre-module lecture for Bachelor theses by **prior arrangement**. Bachelor's theses partly take place externally in cooperation with the Institute of Botany and Landscape Studies.

Practicals in the 2nd block of the SS (lecture-free period: 25.05.-30.05.2026)
All dates are mandatory, please keep them free!

- Tuesday 26.05.26 all day: Weingartner Moor
- Thursday 28.05.26 all day: Kaiserstuhl or Zeutern
- Friday 29.05.26 all day: Rhine meadows near Dettenheim
- Wednesday: 03.06.26 16:00-18:00 Grasses excursion Rappenwörth
- Thursday 10.06.26 15:00-18:00 Mapping on the KIT site (Building 30.28)
- Friday 12.06.26 all day: Northern Black Forest National Park (Huzenbach)
- Thursday 18.06.26 all day: Feldberg excursion
- Final presentation 25.06.2026 from 17:00 hrs

The trips to the excursion locations are organized with Stadtmobil.
In addition to the compulsory dates, personal excursions are created on the basis of historical documents and these are presented in a final presentation.

Workload
Attendance time:

- Lecture: 15 h; 1 SWS; 1 CP
- Practical course: 90 h; 6 SWS; 7 LP

Preparation and follow-up time:

- Lecture: 15 h
- Practical course: 120 h

Teaching and Learning Methods
Lecture, seminar, practical work

Literature
As the literature is almost exclusively in German, the entire module is held in German

M 8.87 Module: Supplementary Studies on Science, Technology and Society [M-FORUM-106753]

Coordinators: Dr. Christine Mielke
Christine Myglas
Organisation: General Studies. Forum Science and Society (FORUM)
Part of: Additional Examinations

Credits	Grading	Recurrence	Duration	Language	Level	Version
16 CP	graded	Each term	3 terms	German	4	1

Election Notes
Students have to self-record the achievements obtained in the Supplementary Studies on Science, Technology and Society in their study plan. FORUM (formerly ZAK) records the achievements as "non-assigned" under "ÜQ/SQ-Leistungen". Further instructions on self-recording of achievements can be found in the FAQ at https://campus.studium.kit.edu/ and on the FORUM homepage at https://www.forum.kit.edu/english/. The title of the examination and the amount of credits override the modules placeholders.

If you want to use FORUM achievements for both your Interdisciplinary Qualifications and for the Supplementary Studies, please record them in the Interdisciplinary Qualifications first. You can then get in contact with the FORUM study services (stg@forum.kit.edu) to also record them in your Supplementary Studies.

In the Advanced Unit you can choose examinations from three subject areas: "About Knowledge and Science", "Science in Society" and "Science in Social Debates". It is advised to complete courses from each of the three subject areas in the Advanced Unit.

To self-record achievements in the Advanced Unit, you have to select a free placeholder partial examination first. The placeholders' title do *not* affect which achievements the placeholder can be used for!

Mandatory			
T-FORUM-113578	Lecture Series Supplementary Studies on Science, Technology and Society - Self Registration	2 CP	Mielke, Myglas
T-FORUM-113579	Basic Seminar Supplementary Studies on Science, Technology and Society - Self Registration	2 CP	Mielke, Myglas
Advanced Unit Supplementary Studies on Science, Technology and Society (Election: at least 12 credits)			
T-FORUM-113580	Elective Specialization Supplementary Studies on Science, Technology and Society / About Knowledge and Science - Self-Registration	3 CP	Mielke, Myglas
T-FORUM-113581	Elective Specialization Supplementary Studies on Science, Technology and Society / Science in Society - Self-Registration	3 CP	Mielke, Myglas
T-FORUM-113582	Elective Specialization Supplementary Studies on Science, Technology and Society / Science in Public Debates - Self Registration	3 CP	Mielke, Myglas
Mandatory			
T-FORUM-113587	Registration for Certificate Issuance - Supplementary Studies on Science, Technology and Society	0 CP	Mielke, Myglas

Assessment
The monitoring is explained in the respective partial achievement.

They are composed of:
- Protocols
- Reflection reports
- Presentations
- Preparation of a project work
- An individual term paper
- An oral examination
- A written exam

Upon successful completion of the supplementary studies, graduates receive a graded report and a certificate issued by the FORUM.

Prerequisites
The course is offered during the course of study and does not have to be completed within a defined period. Enrollment is required for all assessments of the modules in the supplementary studies.
Participation in the supplementary studies is regulated by § 3 of the statutes. KIT students register for the supplementary studies by selecting this module in the student portal and booking a performance themselves. Registration for courses, assessments, and exams is regulated by § 8 of the statutes and is usually possible shortly before the start of the semester.
The course catalog, module description (module manual), statutes (study regulations), and guidelines for creating the various written performance requirements can be downloaded from the FORUM homepage at https://www.forum.kit.edu/begleitstudium-wtg.php.

Registration and exam modalities
PLEASE NOTE:
Registration on the FORUM, i.e. additionally via the module selection in the student portal, enables students to receive up-to-date information about courses or study modalities. In addition, registering on the FORUM ensures that you have proof of the credits you have earned. As it is currently (as of winter semester 24-25) not yet possible to continue additional credits acquired in the Bachelor's programme electronically in the Master's programme, we strongly advise you to digitally secure the credits you have earned by archiving the Bachelor's transcript of records yourself and by registering on FORUM.
In the event that a transcript of records of the Bachelor's certificate is no longer available - we can only assign the achievements of registered students and thus take them into account when issuing the certificate.

Competence Goal
Graduates of the Supplementary Studies on Science, Technology, and Society gain a solid foundation in understanding the interplay between science, the public, business, and politics. They develop practical skills essential for careers in media, political consulting, or research management. The program prepares them to foster innovation, influence social processes, and engage in dialogue with political and societal entities. Participants are introduced to interdisciplinary perspectives, encompassing social sciences and humanities, to enhance their understanding of science, technology, and society. The teaching objectives of this supplementary degree program include equipping participants with both subject-specific knowledge and insights from epistemological, economic, social, cultural, and psychological perspectives on scientific knowledge and its application in various sectors. Students are trained to critically assess and balance the implications of their actions at the intersection of science and society. This training prepares them for roles as students, researchers, future decision-makers, and active members of society.

Through the program, participants learn to contextualize in-depth content within broader frameworks, independently analyze and evaluate selected course materials, and communicate their findings effectively in both written and oral formats. Graduates are adept at analyzing social issues and problem areas, reflecting on them critically from a socially responsible and sustainable standpoint.

Content
The Supplementary Studies on Science, Technology and Society can be started in the 1st semester of the enrolled degree programme and is not limited in time. The wide range of courses offered by FORUM makes it possible to complete the program usually within three semesters. The supplementary studies comprises 16 or more credit points (LP). It consists of **two modules: the Basic Module (4 LP) and the Advanced Module (12 LP).**

The **basic Module** comprises the compulsory courses 'Lecture Series Supplementary Studies on Science, Technology and Society' and a basic seminar with a total of 4 LP.

The **Advanced Module** comprises courses totalling 12 LP in the humanities and social sciences subject areas 'On Knowledge and Science', 'Science in Society' and 'Science in Public Debates'. The allocation of courses to the accompanying study programme can be found on the homepage https://www.forum.kit.edu/wtg-aktuelland in the printed FORUM course catalogue.

The 3 thematic subject areas:

Subject area 1: About Knowledge and Science

This is about the internal perspective of science: students explore the creation of knowledge, distinguishing between scientific and non-scientific statements (e.g., beliefs, pseudo-scientific claims, ideological statements), and examining the prerequisites, goals, and methods of knowledge generation. They investigate how researchers address their own biases, analyze the structure of scientific explanatory and forecasting models in various disciplines, and learn about the mechanisms of scientific quality assurance.

After completing courses in the "Knowledge and Science" area, students can critically reflect on the ideals and realities of contemporary science. They will be able to address questions such as: How robust is scientific knowledge? What are the capabilities and limitations of predictive models? How effective is quality assurance in science, and how can it be improved? What types of questions can science answer, and what questions remain beyond its scope?

Subject area 2: Science in Society

This focuses on the interactions between science and different areas of society, such as how scientific knowledge influences social decision-making and how social demands impact scientific research. Students learn about the specific functional logics of various societal sectors and, based on this understanding, estimate where conflicts of goals and actions might arise in transfer processes—for example, between science and business, science and politics, or science and journalism. Typical questions in this subject area include: How and under what conditions does an innovation emerge from a scientific discovery? How does scientific policy advice work? How do business and politics influence science, and when is this problematic? According to which criteria do journalists incorporate scientific findings into media reporting? Where does hostility towards science originate, and how can social trust in science be strengthened?

After completing courses in the "Sciene in Society" area, students can understand and assess the goals and constraints of actors in different societal sectors. This equips them to adopt various perspectives of communication and action partners in transfer processes and to act competently at various social interfaces with research in their professional lives.

Subject area 3: Science in Public Debates

The courses in this subject area provide insights into current debates on major social issues such as sustainability, digitalization, artificial intelligence, gender equality, social justice, and educational opportunities. Public debates on complex challenges are often polarized, leading to oversimplifications, defamation, or ideological thinking. This can hinder effective social solution-finding processes and alienate people from the political process and from science. Debates about sustainable development are particularly affected, as they involve a wide range of scientific and technological knowledge in both problem diagnosis (e.g., loss of biodiversity, climate change, resource consumption) and solution development (e.g., nature conservation, CCS, circular economy).

By attending courses in "Science in Public Debates," students are trained in an application-oriented way to engage in factual debates—exchanging arguments, addressing their own prejudices, and handling contradictory information. They learn that factual debates can often be conducted more deeply and with more nuance than is often seen in public discourse. This training enables them to handle specific factual issues in their professional lives independently of their own biases and to be open to differentiated, fact-rich arguments.

Supplementary credits:
Additional LP (supplementary work) totalling a maximum of 12 LP can also be acquired from the complementary study programme (see statutes for the WTG complementary study programme § 7). § 4 and § 5 of the statutes remain unaffected by this. These supplementary credits are not included in the overall grade of the accompanying study programme. At the request of the participant, the supplementary work will be included in the certificate of the accompanying study programme and marked as such. Supplementary coursework is listed with the grades provided for in § 9.

Module Grade Calculation
The overall grade of the supplementary course is calculated as a credit-weighted average of the grades that were achieved in the advanced module.

Additional Information
Climate change, biodiversity crisis, antibiotic resistance, artificial intelligence, carbon capture and storage, and gene editing are just a few areas where science and technology can diagnose and address numerous social and global challenges. The extent to which scientific findings are considered in politics and society depends on various factors, such as public understanding and trust, perceived opportunities and risks, and ethical, social, or legal considerations.
To enable students to use their expertise as future decision-makers in solving social and global challenges, we aim to equip them with the skills to navigate the interfaces between science, business, and politics competently and reflectively. In the Supplementary Studies, they acquire foundational knowledge about the interactions between science, technology, and society.

They learn:
- How reliable scientific knowledge is produced,
- how social expectations and demands influence scientific research, and
- how scientific knowledge is adopted, discussed, and utilized by society.

The program integrates essential insights from psychology, philosophy, economics, social sciences, and cultural studies into these topics. After completing the supplementary studies programme, students can place the content of their specialized studies within a broader social context. This prepares them, as future decision-makers, to navigate competently and reflectively at the intersections between science and various sectors of society, such as politics, business, or journalism, and to contribute effectively to innovation processes, public debates, or political decision-making.

Workload
The workload is made up of the number of hours of the individual modules:

- Basic Module approx. 120 hours
- Advanced Module approx. 360 hours
> Total: approx. 480 hours

In the form of supplementary services, up to approximately 360 hours of work can be added.

Recommendations
It is recommended to complete the supplementary study program in three or more semesters, beginning with the lecture series on science, technology, and society in the summer semester. Alternatively, you can start with the basic seminar in the winter semester and then attend the lecture series in the summer semester.

Courses in the Advanced Module can be taken simultaneously. It is also advised to complete courses from each of the three subject areas in the advanced unit.

Teaching and Learning Methods
- Lectures
- Seminars/Project Seminars
- Workshops

9 Module components

T 9.1 Module component: Advanced Light Microscopy (Practical Project) [T-CHEMBIO-100483]

Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-100257 - Project Module: Advanced Light Microscopy

Type	Credits	Grading	Version
Coursework (practical)	7 CP	pass/fail	1

Exams			
WT 25/26	71MPRO-5306	Advanced Light Microscopy (Practical Project)	Bastmeyer, Weth, Bentrop

T 9.2 Module component: Advanced Transcriptomic Analysis [T-CHEMBIO-114861]

Coordinators: Prof. Dr. Simone Mayer
Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-107587 - Research Module: Advanced Transcriptomic Analysis

Type	Credits	Grading	Term offered	Expansion	Version
Examination of another type	8 CP	graded	Each winter term	1 semesters	1

Assessment
Success is assessed in the form of a different type of examination.
A total of 100 points can be earned.

- One part of the examination takes the form of a written test on the lecture and the content of the practical course. This part of the examination can be used to achieve 80 points of the total number of points.
- In addition to this written test, a report on the internship must be prepared, which must meet scientific standards. 10 points can be obtained for this report.
- A presentation must also be given. 10 points can also be earned for this part.

Prerequisites
MFOR5220: Research module - Transcriptome analysis

Workload
240 hours

T 9.3 Module component: Alpine Habitats [T-CHEMBIO-114831]

Coordinators: Maren Riemann
Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-107564 - Research Module: Alpine Habitats

Type	Credits	Grading	Term offered	Expansion	Version
Examination of another type	8 CP	graded	Each winter term	2 semesters	1

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Assessment
The examination is a different type of examination and consists of two parts:
Written examination on the lecture (40 points) and final presentation on the practical part (10 points). A maximum of 50 points can be achieved in total

Prerequisites
Botanical identification exercises

Workload
240 hours

T 9.4 Module component: Application of Bacterial Secretion Systems in Biotechnology, Healthcare and Plant Sciences (Project Module) [T-CHEMBIO-114127]

Coordinators: Prof. Dr. Andreas Diepold
Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-107086 - Project Module: Application of Bacterial Secretion Systems in Biotechnology, Healthcare and Plant Sciences

Type	Credits	Grading	Term offered	Expansion	Version
Coursework	7 CP	pass/fail	Each term	1 semesters	1

Exams			
ST 2025	71MPRO3302	Application of Bacterial Secretion Systems in Biotechnology, Healthcare and Plant Sciences (Project Module)	Diepold
WT 25/26	71MPRO3302	Application of Bacterial Secretion Systems in Biotechnology, Healthcare and Plant Sciences (Project Module)	Diepold

Assessment
The project module is not graded. A qualitative assessment of success takes place in the form of a final presentation.

The success of the internship is reviewed through individual status discussions with the students and inspection of the results of the experiments.

Workload
210 hours

T 9.5 Module component: Bacterial Genomic & Computational Biology (Pactical Project) [T-CHEMBIO-109787]

Coordinators: Dr. John Vollmers
Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-104785 - Project Module: Bacterial Genomic & Computational Biology

Type	Credits	Grading	Term offered	Version
Coursework (practical)	7 CP	pass/fail	Each term	1

Exams			
ST 2025	71MPRO-4331	Bacterial Genomic & Computational Biology (Pactical Project)	Vollmers, Kaster, Sturm, Müller
WT 25/26	71MPRO-4331	Bacterial Genomic & Computational Biology (Pactical Project)	Kaster, Vollmers, Sturm, Müller

Prerequisites
none

Workload
210 hours

T 9.6 Module component: Basic Seminar Supplementary Studies on Science, Technology and Society - Self Registration [T-FORUM-113579]

Coordinators: Dr. Christine Mielke
Christine Myglas
Organisation: General Studies. Forum Science and Society (FORUM)
Part of: M-FORUM-106753 - Supplementary Studies on Science, Technology and Society

Type	Credits	Grading	Term offered	Expansion	Version
Coursework	2 CP	pass/fail	Each summer term	1 semesters	1

Assessment
Study achievement in the form of a presentation or a term paper or project work in the selected course.

Prerequisites
None

Self Service Assignment of Supplementary Studies
This module component can be used for self service assignment of grades acquired from the following study providers:

- Studium Generale. Forum Wissenschaft und Gesellschaft (FORUM) (ehem. ZAK)
- FORUM (ehem. ZAK) Begleitstudium

Recommendations
It is recommended that the basic seminar be completed during the same semester as the lecture series "Science in Society". If it is not possible to attend the lecture series and the basic seminar in the same semester, the basic seminar can also be attended in the semesters before the lecture series.
However, attending courses in the advanced unit before attending the basic seminar should be avoided.

T 9.7 Module component: Biochemical Seminar 1 - Presentation Skills [T-CHEMBIO-100499]

Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-100275 - Concept Development

Type	Credits	Grading	Version
Examination of another type	3 CP	graded	1

Exams			
ST 2025	71MSQ01-P-7401	Biochemical Seminar 1 - Presentation Skills	Ulrich

T 9.8 Module component: Biochemical Seminar 2 - Techniques of Information Management [T-CHEMBIO-100508]

Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-100275 - Concept Development

Type	Credits	Grading	Version
Examination of another type	3 CP	graded	1

Exams			
ST 2025	71MSQ01-R-7402	Biochemical Seminar 2 - Techniques of Information Management	Ulrich

T 9.9 Module component: Biochemistry - Genetics, Protein Chemical Methods (Practical Research Course) [T-CHEMBIO-100516]

Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-100269 - Research Module: Genetics and Protein Chemistry

Type	Credits	Grading	Version
Coursework (practical)	7 CP	pass/fail	1

T 9.10 Module component: Biochemistry - Peptide Structure and Function (Practical Project) [T-CHEMBIO-100519]

Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-100271 - Project Module: Structure and Function of Peptides

Type	Credits	Grading	Version
Coursework (practical)	7 CP	pass/fail	1

Exams			
ST 2025	71MPRO-7303	Biochemistry - Peptide Structure and Function (Practical Project)	Ulrich

T 9.11 Module component: Biochemistry - Protein Purification, Kinetics (Practical Research Course) [T-CHEMBIO-100518]

Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-100270 - Research Module: Protein Isolation and Kinetics

Type	Credits	Grading	Version
Coursework (practical)	7 CP	pass/fail	1

T 9.12 Module component: Biochemistry II - Genetics (Lecture) [T-CHEMBIO-100515]

Coordinators: Prof. Dr. Anne Ulrich
Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-100269 - Research Module: Genetics and Protein Chemistry

Type	Credits	Grading	Version
Written examination	1 CP	graded	1

Exams			
ST 2025	71MFOR-V-7201	Biochemistry II - Genetics (Lecture)	Ulrich

Prerequisites
none

T 9.13 Module component: Biochemistry II - Protein Purification (Lecture) [T-CHEMBIO-100517]

Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-100270 - Research Module: Protein Isolation and Kinetics

Type	Credits	Grading	Version
Written examination	1 CP	graded	1

Exams			
ST 2025	71MFOR-V-7202	Biochemistry II - Protein Purification (Lecture)	Ulrich

T 9.14 Module component: Bioinformatics [T-CHEMBIO-112608]

Coordinators: Prof. Dr. Anne-Kristin Kaster
Dr. John Vollmers
Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-106206 - Research Module: Bioinformatics

Type	Credits	Grading	Term offered	Version
Examination of another type	8 CP	graded	Each summer term	2

Exams			
WT 25/26	71MFOR-4211	Bioinformatics	Kaster, Sturm, Vollmers

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Assessment
Other type of examination

- 80 points - written examination
- 10 points - practical work and report
- 10 points - final presentation/lecture

Prerequisites
none

Workload
240 hours

T 9.15 Module component: Bioinformatics (Practical Project) [T-CHEMBIO-100418]

Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-100211 - Project Module: Bioinformatics

Type	Credits	Grading	Version
Coursework (practical)	7 CP	pass/fail	1

Exams			
WT 25/26	71MPRO-1310	Bioinformatik (Projektpraktikum)	Sturm

T 9.16 Module component: Biomolecular Microanalytics [T-CHEMBIO-108707]

Coordinators: Prof. Dr. Christof Niemeyer
Dr. Tim Scharnweber
Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-100267 - Research Module: Biomolecular Microanalytics

Type	Credits	Grading	Term offered	Version
Written examination	8 CP	graded	Each summer term	1

Exams			
ST 2025	71108707	Biomolecular Microanalytics	Niemeyer

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Assessment
Written exam lasting 120 minutes.

Prerequisites
none

Workload
240 hours

T 9.17 Module component: Biomolecular Microanalytics (Practical Project) [T-CHEMBIO-100512]

Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-100268 - Project Module: Biomolecular Microanalytics

Type	Credits	Grading	Version
Coursework (practical)	7 CP	pass/fail	1

Exams			
ST 2025	71MPRO-3306	Biomolekular Microanalytics (Practical Project)	Niemeyer
WT 25/26	71MPRO-3306	Biomolecular Microanalytics (Practical Project)	Niemeyer

T 9.18 Module component: Biophotonics in Life Sciences (Practical Project) [T-CHEMBIO-113751]

Coordinators: Prof. Dr. Moritz Kreysing
Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-106861 - Project Module: Biophotonics in Life Sciences

Type	Credits	Grading	Term offered	Expansion	Version
Coursework	7 CP	pass/fail	Each term	1 semesters	1

Workload
210 hours

T 9.19 Module component: Botanical Seminar 1 - Presentation Skills [T-CHEMBIO-100489]

Coordinators: Prof. Dr. Peter Nick
Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-100275 - Concept Development

Type	Credits	Grading	Version
Examination of another type	3 CP	graded	3

Exams			
ST 2025	71MSQ01-1401	Botanical Seminar 1	Nick
ST 2025	71MSQ01-P-1401	Botanical Seminar 1 - Presentation Skills	Nick

Prerequisites
none

Recommendations
https://www.jkip.kit.edu/botzell/561.php

Additional Information
Language:
Winter semester - German
Summer semester - English

T 9.20 Module component: Botanical Seminar 1 - Techniques of Information Management [T-CHEMBIO-100503]

Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-100275 - Concept Development

Type	Credits	Grading	Version
Examination of another type	3 CP	graded	1

Exams			
ST 2025	71MSQ01-1401	Botanical Seminar 1	Nick

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

T 9.21 Module component: Botanical Seminar 3 - Techniques of Information Management [T-CHEMBIO-100504]

Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-100275 - Concept Development

Type	Credits	Grading	Version
Examination of another type	3 CP	graded	2

T 9.22 Module component: Botanical Seminar 4 - Techniques of Information Management [T-CHEMBIO-100510]

Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-100275 - Concept Development

Type	Credits	Grading	Version
Examination of another type	3 CP	graded	1

Exams			
WT 25/26	71SQ01-R-2403	Botanisches Seminar 4 - Techniken von Recherche und Informationsmanagement	Puchta, Capdeville, Gehrke, Rönspies

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

T 9.23 Module component: Cellular and Medicinal Microbiology [T-CHEMBIO-110761]

Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-105294 - Research Module: Cellular and Medicinal Microbiology

Type	Credits	Grading	Term offered	Version
Examination of another type	8 CP	graded	Each summer term	1

Exams			
ST 2025	71MFOR-4205	Cellular and Medicinal Microbiology	Fischer, Schmidt-Heydt

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Assessment
The control of success is an examination of another type. The Maximum 100 points can be reached. These points consits the following components:

- On examination is an oral part,with this performance 90 points can be reached.
- Beside this written test, a protocol of the practical part must be written. This protocol must be in accordance with scientific requirements.
  For this protocol 10 points can be reached.

Prerequisites
none

Workload
240 hours

T 9.24 Module component: Cellular and Medicinal Microbiology (Practical Project) [T-CHEMBIO-110792]

Coordinators: Prof. Dr. Reinhard Fischer
PD Dr. Markus Schmidt-Heydt
Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-105304 - Project Module: Cellular and Medicinal Microbiology

Type	Credits	Grading	Version
Coursework (practical)	7 CP	pass/fail	1

Exams			
ST 2025	71MPRO-4305	Cellular and Medicinal Microbiology (Practical Project)	Fischer
WT 25/26	71MPRO-4305	Cellular and Medicinal Microbiology (Practical Project)	Schmidt-Heydt, Fischer

T 9.25 Module component: Chromatin Structures in Cell Division and Development [T-CHEMBIO-111754]

Coordinators: Prof. Dr. Sylvia Erhardt
Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-105842 - Research Module: Chromatin Structures in Cell Division and Development

Type	Credits	Grading	Term offered	Version
Examination of another type	8 CP	graded	Each summer term	1

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Assessment
Success is assessed in the form of a **different type of examination.**

Part of the assessment takes the form of a written test lasting approx. 90 minutes on the lecture and the content of the practical course. 80% of the points can be achieved through this part of the examination. In addition to this written test, a protocol of the practical course must be prepared, which must meet scientific standards. In addition, a method of chromatin research must be presented as a short lecture (topics are assigned). 20% of the points can be achieved through the protocol and short presentation.

Prerequisites
none

Workload
240 hours

T 9.26 Module component: Chromatin Structures in Cell Division and Development (Practical Project) [T-CHEMBIO-112786]

Coordinators: Prof. Dr. Sylvia Erhardt
Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-106307 - Project Module: Chromatin Structures in Cell Division and Development

Type	Credits	Grading	Term offered	Version
Coursework (practical)	7 CP	pass/fail	Each term	1

Exams			
ST 2025	71112786	Chromatin Structures in Cell Division and Development (Practical Project)	Erhardt

Assessment

- The project module is an ungraded course achievement
- A report on the contents of the internship must be prepared.
- The qualitative assessment of success takes place in the form of a presentation in English.
- During the internship, performance is assessed through individual status discussions with the students and inspection of the results of their experiments.

Workload
210 hours

T 9.27 Module component: Current Topics in Cellular Neurobiology - Presentation Skills [T-CHEMBIO-100498]

Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-100275 - Concept Development

Type	Credits	Grading	Version
Examination of another type	3 CP	graded	2

Exams			
ST 2025	71MSQ01-P-5404	Current Topics in Cellular Neurobiology - Presentation Skills	Hilbert, Bentrop, Weth
WT 25/26	71SQ01-P-5404	Current Topics in Cellular Neurobiology - Vortragstechniken	Bastmeyer, Bentrop, Weth, Hilbert

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

T 9.28 Module component: Current Topics in Molecular Genetics - Presentation Skills [T-CHEMBIO-100501]

Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-100275 - Concept Development

Type	Credits	Grading	Version
Examination of another type	3 CP	graded	2

Exams			
ST 2025	71MSQ01-P-3402	Current Topics in Molecular Genetics - Presentation Skills	Kämper

T 9.29 Module component: Current topics in Neurogenomics: Dissecting the Central Dogma of Biology within the Neuron - Presentation Techniques [T-CHEMBIO-114859]

Coordinators: Prof. Dr. Simone Mayer
TT-Prof. Dr. Miha Modic
Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-100275 - Concept Development

Type	Credits	Grading	Term offered	Expansion	Version
Examination of another type	3 CP	graded	Each winter term	1 semesters	2

Assessment
Presentation of scientific publications, contribution to discussions

Prerequisites
none

Recommendations
Konopka, G., Bhaduri, A. Functional genomics and systems biology in human neuroscience. Nature 623, 274-282 (2023). https://doi.org/10.1038/s41586-023-06686-1

Raj B, Blencowe BJ. Alternative Splicing in the Mammalian Nervous System: Recent Insights into Mechanisms and Functional Roles. Neuron. 2015 Jul 1;87(1):14-27. doi: 10.1016/j.neuron.2015.05.004.

Chen, A.Y., Owens, M.C. & Liu, K.F. Coordination of RNA modifications in the brain and beyond. Mol Psychiatry 28, 2737-2749 (2023). https://doi.org/10.1038/s41380-023-02083-2

Additional Information
Language: English

Workload
90 hours

T 9.30 Module component: Current topics in Neurogenomics: Dissecting the Central Dogma of Biology within the Neuron - Techniques of Research and Information Management [T-CHEMBIO-114858]

Coordinators: Prof. Dr. Simone Mayer
TT-Prof. Dr. Miha Modic

Organisation: KIT Department of Chemistry and Biosciences

Part of: M-CHEMBIO-100275 - Concept Development

Type	Credits	Grading	Term offered	Expansion	Version
Examination of another type	3 CP	graded	Each winter term	1 semesters	2

Assessment
Presentation of scientific publications, contribution to discussions

Prerequisites
none

Recommendations
Konopka, G., Bhaduri, A. Functional genomics and systems biology in human neuroscience. Nature 623, 274-282 (2023). https://doi.org/10.1038/s41586-023-06686-1

Raj B, Blencowe BJ. Alternative Splicing in the Mammalian Nervous System: Recent Insights into Mechanisms and Functional Roles. Neuron. 2015 Jul 1;87(1):14-27. doi: 10.1016/j.neuron.2015.05.004.

Chen, A.Y., Owens, M.C. & Liu, K.F. Coordination of RNA modifications in the brain and beyond. Mol Psychiatry 28, 2737-2749 (2023). https://doi.org/10.1038/s41380-023-02083-2

Additional Information
Language: English

Workload
90 hours

T 9.31 Module component: Current Topics in the Life Science [T-CHEMBIO-100554]

Coordinators: Prof. Dr. Véronique Orian-Rousseau
Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-100277 - Interdisciplinary Thinking

Type	Credits	Grading	Version
Coursework (oral)	3 CP	pass/fail	1

Exams			
ST 2025	7100066	Current Topics in the Life Science	Orian-Rousseau

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

T 9.32 Module component: Current Topics Stem Cell Biology: Gene Regulation Programs Driving Stemness and Differentiation - Presentation Skills [T-CHEMBIO-114330]

Coordinators: Prof. Dr. Sylvia Erhardt
Prof. Dr. Simone Mayer

Organisation: KIT Department of Chemistry and Biosciences

Part of: M-CHEMBIO-100275 - Concept Development

Type	Credits	Grading	Term offered	Version
Examination of another type	3 CP	graded	Each summer term	1

Exams			
ST 2025	71MSQ01-P-5405	Current Topics Stem Cell Biology: Gene Regulation Programs Driving Stemness and Differentiation - Presentation Skills	Mayer, Erhardt, Hilbert

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Prerequisites
none

Recommendations
https://link.springer.com/book/10.1007/978-3-031-39027-2

Additional Information
In this module, we will get an overview of different sub-topics of stem cell biology in a highly interactive format. Students will first present review papers to get an overview of a specific topic and will subsequently present primary research papers related to the overarching review.

T 9.33 Module component: Current Topics Stem Cell Biology: Gene Regulation Programs Driving Stemness and Differentiation - Techniques of Research and Information Management [T-CHEMBIO-114849]

Coordinators: Prof. Dr. Sylvia Erhardt
Prof. Dr. Simone Mayer

Organisation: KIT Department of Chemistry and Biosciences

Part of: M-CHEMBIO-100275 - Concept Development

Type	Credits	Grading	Version
Examination of another type	3 CP	graded	1

Prerequisites
none

Workload
90 hours

T 9.34 Module component: Developmental Neurobiology [T-CHEMBIO-108677]

Coordinators: Prof. Dr. Martin Bastmeyer
Dr. Joachim Bentrop
Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-100249 - Research Module: Developmental Neurobiology

Type	Credits	Grading	Term offered	Version
Examination of another type	8 CP	graded	Each winter term	1

Exams			
WT 25/26	71MFOR-5207	Developmental Neurobiology	Bastmeyer, Bentrop, Weth

Assessment
Success is assessed in the form of a different type of examination.
A total of 100 points can be earned.

- The first part of the examination is a written exam lasting 120 minutes on the lecture and the content of the practical course. Up to 80 points can be achieved in this part of the examination.
- In addition to this written test, a report on the internship must be prepared, which must meet scientific standards. Up to 10 points are awarded for this report.
- A presentation must also be given. 10 points can also be earned for this part.

Prerequisites
none

Additional Information
Information about the animals and their use:

This module involves working with animals. Zebrafish from the laboratory's own husbandry are mated to obtain embryos. Studies are carried out on these embryos up to an age of 5 dpf. Swabs can also be taken from the body surface of adult animals. Molecular biological and histological examinations are carried out on organs from laboratory-bred mice. Chicken eggs for embryo collection (E6 of 21) come from a commercial breeding farm. All husbandry and interventions are approved by the responsible regional council.

Reasons why the use of animals cannot be dispensed with in this module:

The development of the nervous system in vertebrates is based on complex interactions between the cell types involved. Often only some of the cell types or proteins involved have been identified. These questions cannot be fully investigated in in vitro culture systems because not all molecular parameters are known that would have to be reconstructed in these systems. Furthermore, the complex spatial environment in which nerve cells differentiate cannot be fully simulated in culture.

Information on the courses and assessments to which students can alternatively switch:

This is an elective course; students can alternatively take other FOR modules that do not involve working with animals.

Workload
240 hours

T 9.35 Module component: Diversity, Systematics and Evolution of Insects [T-CHEMBIO-114315]

Coordinators: Prof. Dr. Martin Husemann
Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-107269 - Research Module: Diversity, Systematics and Evolution of Insects

Type	Credits	Grading	Term offered	Version
Examination of another type	8 CP	graded	Each summer term	1

Exams			
ST 2025	71MFOR8203	Diversity, Systematics and Evolution of Insects	Husemann

Assessment
This consists of cooperation, a written examination, a paper presentation, the project presentation and the project report.

Workload
240 hours

T 9.36 Module component: Ecology of City Trees under Global Change [T-CHEMBIO-113844]

Coordinators: Dr. Somidh Saha
Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-106908 - Research Module: Ecology of City Trees under Global Change

Type	Credits	Grading	Term offered	Expansion	Version
Examination of another type	8 CP	graded	Each winter term	1 semesters	1

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Prerequisites
Students should be open to data collection and excursion from outdoor trees (near streets, parks, cemeteries, etc.) during the module from mid-January to mid-February.

Workload
240 hours

T 9.37 Module component: Elective Specialization Supplementary Studies on Science, Technology and Society / About Knowledge and Science - Self-Registration [T-FORUM-113580]

Coordinators: Dr. Christine Mielke
Christine Myglas

Organisation: General Studies. Forum Science and Society (FORUM)

Part of: M-FORUM-106753 - Supplementary Studies on Science, Technology and Society

Type	Credits	Grading	Term offered	Version
Examination of another type	3 CP	graded	Each term	1

Assessment
Another type of examination assessment under § 5, section 3 involves a presentation, term paper, or project work within the chosen course.

Prerequisites
None

Self Service Assignment of Supplementary Studies
This module component can be used for self service assignment of grades acquired from the following study providers:

- Studium Generale. Forum Wissenschaft und Gesellschaft (FORUM) (ehem. ZAK)
- FORUM (ehem. ZAK) Begleitstudium

Recommendations
The contents of the basic module are helpful. The basic module should be completed or attended in parallel, but not after the advanced module.
The reading recommendations for primary and specialist literature are determined individually by the respective lecturers according to the subject area and course.

Additional Information
This placeholder can be used for any achievement in the Advanced Unit of the Supplementary Studies.

In the Advanced Module, students can choose their own individual focus, e.g. sustainable development, data literacy, etc. The focus should be discussed with the module coordinator at the FORUM.

T 9.38 Module component: Elective Specialization Supplementary Studies on Science, Technology and Society / Science in Public Debates - Self Registration [T-FORUM-113582]

Coordinators: Dr. Christine Mielke
Christine Myglas

Organisation: General Studies. Forum Science and Society (FORUM)

Part of: M-FORUM-106753 - Supplementary Studies on Science, Technology and Society

Type	Credits	Grading	Term offered	Version
Examination of another type	3 CP	graded	Each term	1

Assessment
Another type of examination assessment under § 5, section 3 involves a presentation, term paper, or project work within the chosen course.

Prerequisites
None

Self Service Assignment of Supplementary Studies
This module component can be used for self service assignment of grades acquired from the following study providers:

- Studium Generale. Forum Wissenschaft und Gesellschaft (FORUM) (ehem. ZAK)
- FORUM (ehem. ZAK) Begleitstudium

Recommendations
The contents of the basic module are helpful. The basic module should be completed or attended in parallel, but not after the advanced module.
The reading recommendations for primary and specialist literature are determined individually by the respective lecturers according to the subject area and course.

Additional Information
This placeholder can be used for any achievement in the Advanced Unit of the Supplementary Studies.

T 9.39 Module component: Elective Specialization Supplementary Studies on Science, Technology and Society / Science in Society - Self-Registration [T-FORUM-113581]

Coordinators: Dr. Christine Mielke
Christine Myglas

Organisation: General Studies. Forum Science and Society (FORUM)

Part of: M-FORUM-106753 - Supplementary Studies on Science, Technology and Society

Type	Credits	Grading	Term offered	Version
Examination of another type	3 CP	graded	Each term	1

Assessment
Another type of examination assessment under § 5, section 3 involves a presentation, term paper, or project work within the chosen course.

Prerequisites
None

Self Service Assignment of Supplementary Studies
This module component can be used for self service assignment of grades acquired from the following study providers:

- Studium Generale. Forum Wissenschaft und Gesellschaft (FORUM) (ehem. ZAK)
- FORUM (ehem. ZAK) Begleitstudium

Recommendations
The contents of the basic module are helpful. The basic module should be completed or attended in parallel, but not after the advanced module.
The reading recommendations for primary and specialist literature are determined individually by the respective lecturers according to the subject area and course.

Additional Information
This placeholder can be used for any achievement in the Advanced Unit of the Supplementary Studies.

T 9.40 Module component: Epigenetics [T-CHEMBIO-111322]

Coordinators: Prof. Dr. Sylvia Erhardt
Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-105669 - Research Module: Epigenetics

Type	Credits	Grading	Term offered	Version
Examination of another type	8 CP	graded	Each summer term	1

Exams			
ST 2025	71MFOR-7201	Epigenetics	Erhardt

Assessment
Success is assessed in the form of a different type of examination
A total of 100 points can be earned.

Part of the performance assessment takes the form of a written test lasting 120 minutes on the lecture and the content of the practical course. This part of the examination can be used to achieve 80 points of the total number of points. In addition to this written test, a report on the internship must be prepared, which must meet scientific standards. This report can earn 10 points. Furthermore, the work of the internship must be presented within the working group as a poster or lecture. 10 points can also be earned for this part.

Prerequisites
none

Workload
240 hours

T 9.41 Module component: Epigenetics (Practical Project) [T-CHEMBIO-111333]

Coordinators: Prof. Dr. Sylvia Erhardt
Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-105678 - Project Module: Epigenetics

Type	Credits	Grading	Term offered	Version
Coursework (practical)	7 CP	pass/fail	Each term	1

Exams			
ST 2025	71MPRO-7301	Epigenetics (Practical Project)	Erhardt

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Assessment

- The project module is an ungraded course achievement.
- A protocol on the contents of the internship must be prepared.
- The qualitative performance review takes place in the form of a presentation.
- During the internship, the performance is checked by individual status discussions with the students and inspection of the results of their experiments.

T 9.42 Module component: ExperiMentoring - The Mentoring-Program [T-CHEMBIO-111744]

Coordinators: Dr. Katrin Sturm-Richter
Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-100277 - Interdisciplinary Thinking

Type	Credits	Grading	Term offered	Version
Coursework	3 CP	pass/fail	Each winter term	5

Exams			
WT 25/26	71ÜQ-123	ExperiMentoring	Sturm-Richter

Assessment
Feedback forms and final report

Prerequisites
The orientation exam must be passed

Workload
90 hours

T 9.43 Module component: Flower Ecology (Practical Project) [T-CHEMBIO-113285]

Coordinators: Dr. Heiko Hentrich
Prof. Dr. Peter Nick
Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-106596 - Project Module: Flower Ecology

Type	Credits	Grading	Version
Coursework (practical)	7 CP	pass/fail	1

Assessment
The project module is not graded. A qualitative performance review takes place in the form of an accepted protocol and a final presentation (30 min).

Workload
210 hours

T 9.44 Module component: Food Toxicology [T-CHEMBIO-104464]

Coordinators: Prof. Dr. Andrea Hartwig
Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-105674 - General and Food Toxicology for Biology Students

Type	Credits	Grading	Version
Oral examination	6 CP	graded	1

Exams			
ST 2025	71M104464a	Food Toxicology	Hartwig, Köberle
ST 2025	71M104464b	Food Toxicology	Hartwig, Köberle
WT 25/26	71M104464a	Food Toxicology	Hartwig, Köberle
WT 25/26	71M104464b	Food Toxicology	Hartwig, Köberle

Workload
180 hours

T 9.45 Module component: From Samples to Sequences [T-CHEMBIO-111319]

Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-105666 - Research Module: From Samples to Sequences

Type	Credits	Grading	Term offered	Version
Examination of another type	8 CP	graded	Each summer term	1

Exams			
ST 2025	71MFOR-4212	From Samples to Sequences	Kaster, Sturm, Vollmers

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Assessment
Examination performance of a different kind consisting of:

- written test of 120 minutes, on the lecture and the contents of the internship. 80 points of the total score can be achieved.
- a report on the internship must be prepared, which must meet scientific standards. 10 points can be obtained.
- the work of the internship must be presented in a lecture. 10 points can be earned.

Prerequisites
none

Workload
240 hours

T 9.46 Module component: Genetics of Lower Eukaryotes [T-CHEMBIO-108661]

Coordinators: Prof. Dr. Jörg Kämper
Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-100224 - Research Module: Genetics of Lower Eukaryotes

Type	Credits	Grading	Term offered	Version
Examination of another type	8 CP	graded	Each summer term	1

Prerequisites
none

Workload
240 hours

T 9.47 Module component: Innovative Microscopy (Practical Project) [T-CHEMBIO-113752]

Coordinators: Prof. Dr. Moritz Kreysing
Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-106862 - Project Module: Innovative Microscopy

Type	Credits	Grading	Term offered	Expansion	Version
Coursework	7 CP	pass/fail	Each term	1 semesters	1

Exams			
ST 2025	7100073	Innovative Microscopy (Practical Project)	Kreysing

Workload
210 hours

T 9.48 Module component: Intensification of Bioprocesses - Written Exam [T-CIWVT-112998]

Coordinators: Prof. Dr.-Ing. Dirk Holtmann
Organisation: KIT Department of Chemical and Process Engineering
Part of: M-CIWVT-106416 - Intensification of Bioprocesses

Type	Credits	Grading	Version
Written examination	6 CP	graded	1

Exams			
ST 2025	7212050-WP-IBP	Intensification of Bioprocesses - Written Exam	Holtmann
WT 25/26	7212050-WP-IBP	Intensification of Bioprocesses - Written Exam	Holtmann

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

T 9.49 Module component: Intensivication of Bioprocesses - Lab [T-CIWVT-112999]

Coordinators: Prof. Dr.-Ing. Dirk Holtmann
Dr. Anke Neumann
Organisation: KIT Department of Chemical and Process Engineering
Part of: M-CIWVT-106416 - Intensification of Bioprocesses

Type	Credits	Grading	Version
Examination of another type	3 CP	graded	1

Exams			
ST 2025	7212052-P-IBP	Intensification of Bioprocesses - Lab	Neumann

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

T 9.50 Module component: Interdisciplinary Seminar Developmental Biology [T-CHEMBIO-100551]

Coordinators: Dr. habil. Dietmar Gradl
Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-100277 - Interdisciplinary Thinking

Type	Credits	Grading	Version
Coursework (oral)	3 CP	pass/fail	1

Exams			
WT 25/26	71SQ03-E	Interdisciplinary Seminar Developmental Biology	Gradl, Fischer, Nick

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

T 9.51 Module component: Interdisciplinary Seminar Molecular Biology [T-CHEMBIO-100552]

Coordinators: Prof. Dr. Jörg Kämper
Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-100277 - Interdisciplinary Thinking

Type	Credits	Grading	Term offered	Version
Coursework (oral)	3 CP	pass/fail	Each winter term	2

Exams			
ST 2025	7100061	Interdisciplinary Seminar Molecular Biology	Kämper, Puchta, Orian-Rousseau, Müller
WT 25/26	7100029	Interdisciplinary Seminar Molecular Biology	Kämper, Puchta, Orian-Rousseau, Müller

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

T 9.52 Module component: Introduction to R [T-BGU-107481]

Coordinators: Prof. Dr. Sebastian Schmidtlein
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105575 - Ecology

Type	Credits	Grading	Term offered	Version
Coursework (written)	3 CP	pass/fail	Each summer term	1

Exams			
ST 2025	8261102915	Introduction to R	Schmidtlein

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Prerequisites
None

Recommendations
None

Additional Information
None

Workload
90 hours

T 9.53 Module component: Lecture Series Supplementary Studies on Science, Technology and Society - Self Registration [T-FORUM-113578]

Coordinators: Dr. Christine Mielke
Christine Myglas
Organisation: General Studies. Forum Science and Society (FORUM)
Part of: M-FORUM-106753 - Supplementary Studies on Science, Technology and Society

Type	Credits	Grading	Term offered	Expansion	Version
Coursework	2 CP	pass/fail	Each summer term	1 semesters	1

Assessment
Active participation, learning protocols, if applicable.

Prerequisites
None

Self Service Assignment of Supplementary Studies
This module component can be used for self service assignment of grades acquired from the following study providers:

- Studium Generale. Forum Wissenschaft und Gesellschaft (FORUM) (ehem. ZAK)
- FORUM (ehem. ZAK) Begleitstudium

Recommendations
It is recommended that you complete the lecture series "Science in Society" before attending events in the advanced module and in parallel with attending the basic seminar.
If it is not possible to attend the lecture series and the basic seminar in the same semester, the lecture series can also be attended after attending the basic seminar.
However, attending events in the advanced module before attending the lecture series should be avoided.

Additional Information
The basic module consists of the lecture series "Science in Society" and the basic seminar. The lecture series is only offered during the summer semester.
The basic seminar can be attended in the summer or winter semester.

T 9.54 Module component: Marine Biology on Heligoland (Research Practial) [T-CHEMBIO-114860]

Coordinators: Dr. Gabriele Jürges
Dr. Urszula Weclawski

Organisation: KIT Department of Chemistry and Biosciences

Part of: M-CHEMBIO-107565 - Research Module: Marine Biology on Heligoland

Type	Credits	Grading	Expansion	Version
Examination of another type	8 CP	graded	2 semesters	1

Assessment
The performance assessment is a different type of examination

Written examination on the lecture (80 points)
Practical work and report (10 points)
Presentations (10 points)

Workload
240 hours

T 9.55 Module component: Marine Biology on Isola del Giglio (Research Practial) [T-CHEMBIO-114852]

Coordinators: Prof. Dr. Simone Mayer
Dr. Urszula Weclawski

Organisation: KIT Department of Chemistry and Biosciences

Part of: M-CHEMBIO-107584 - Research Module: Marine Biology on Isola del Giglio

Type	Credits	Grading	Expansion	Version
Examination of another type	8 CP	graded	2 semesters	1

Exams			
WT 25/26	71MFOR-5209	Marine Biology on Isola del Giglio (Research Practial)	Jürges, Weclawski

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Assessment
The performance assessment is a different type of examination

Written examination on the lecture (80 points)
Practical work and report (10 points)
Presentations (10 points)

Workload
240 hours

T 9.56 Module component: Master's Thesis [T-CHEMBIO-100150]

Organisation:

Part of: M-CHEMBIO-100178 - Master's Thesis

Type	Credits	Grading	Version
Final Thesis	30 CP	graded	2

Assessment
See Module

Prerequisites
90 LP have to be absolved

Final Thesis
This module component represents a final thesis. The following periods have been supplied:

Submission deadline	6 months
Maximum extension period	3 months
Correction period	8 weeks

T 9.57 Module component: Methods of Developmental Biology [T-CHEMBIO-108975]

Coordinators: Dr. habil. Dietmar Gradl
Prof. Dr. Ferdinand le Noble

Organisation: KIT Department of Chemistry and Biosciences

Part of: M-CHEMBIO-100251 - Research Module: Methods of Developmental Biology

Type	Credits	Grading	Term offered	Version
Examination of another type	8 CP	graded	Each term	2

Exams			
ST 2025	71MFOR-6202	Methods of Developmental Biology	Gradl, le Noble

Assessment
Examination of a different kind

- Success is assessed in the form of a written examination lasting 120 minutes on the lecture and the content of the practical course - 80 points
- The contents of the practical course and the results of the experiments are discussed and reviewed in a presentation - 10 points
- The results are summarized in a protocol - 10 points

Prerequisites
none

Workload
240 hours

T 9.58 Module component: Methods of Developmental Biology (Practical Project) [T-CHEMBIO-100494]

Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-100265 - Project Module: Methods of Developmental Biology

Type	Credits	Grading	Version
Coursework (practical)	7 CP	pass/fail	1

Exams			
WT 25/26	71MPRO-6302	Methods of Developmental Biology	le Noble, Gradl

T 9.59 Module component: Methods of Developmental Genetics [T-CHEMBIO-108671]

Coordinators: Prof. Dr. Lennart Hilbert
Prof.Dr. Uwe Strähle

Organisation: KIT Department of Chemistry and Biosciences

Part of: M-CHEMBIO-103095 - Research Module: Methods of Developmental Genetics

Type	Credits	Grading	Term offered	Version
Examination of another type	8 CP	graded	Each winter term	2

Assessment
Success is assessed in the form of a different type of examination.

- One part of the examination takes the form of a written test on the lecture and the content of the practical course. This part of the examination is worth 80 points of the total number of points.
- In addition to this written test, a report on the internship must be prepared, which must meet scientific standards. 10 points can be obtained for this report.
- A presentation must also be given. 10 points can also be earned for this part.

Prerequisites
none

Workload
240 hours

T 9.60 Module component: Methods of Developmental Genetics (Advanced Practical Course) [T-CHEMBIO-106140]

Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-103096 - Project Module: Methods of Developmental Genetics

Type	Credits	Grading	Term offered	Version
Coursework (practical)	7 CP	pass/fail	Each winter term	1

Exams			
ST 2025	71MPRO-3308	Methods of Developmental Genetics (Advanced Practical Course)	Hilbert, Rastegar
WT 25/26	71MPRO-3308	Methods of Developmental Genetics (Advanced Practical Course)	Hilbert, Rastegar

Prerequisites
none

Workload
210 hours

T 9.61 Module component: Microbiological Seminar - Presentation Skills [T-CHEMBIO-100495]

Coordinators: Prof. Dr. Andreas Diepold
Prof. Dr. Reinhard Fischer
Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-100275 - Concept Development

Type	Credits	Grading	Version
Examination of another type	3 CP	graded	2

Exams			
ST 2025	71MSQ01-P-4401	Microbiological Seminar - Presentation Skills	Fischer, Kämper, Diepold
WT 25/26	71SQ01-P-4401	Mikrobiologisches Seminar 1 - Vortragstechniken	Fischer, Diepold

T 9.62 Module component: Microbiological Seminar 2 - Techniques of Information Management [T-CHEMBIO-100506]

Organisation: KIT Department of Chemistry and Biosciences

Part of: M-CHEMBIO-100275 - Concept Development

Type	Credits	Grading	Version
Examination of another type	3 CP	graded	2

Exams			
ST 2025	71MSQ01-R-4402	Microbiological Seminar 2 - Techniques of Information Management	Fischer, Kämper, Diepold

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

T 9.63 Module component: Microbiology of Eukaryotes [T-CHEMBIO-108663]

Coordinators: Prof. Dr. Reinhard Fischer
Dr. Maria Cristina Stroe
Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-100225 - Research Module: Microbiology of Eukaryotes

Type	Credits	Grading	Term offered	Version
Examination of another type	8 CP	graded	Each winter term	2

Exams			
ST 2025	71MPRO-4306	Mikrobiology of Eukaryotes (Practical Project)	Fischer
WT 25/26	71MFOR-4206	Mikrobiology of Eukaryotes	Fischer

Prerequisites
none

Workload
240 hours

T 9.64 Module component: Microbiology of Eukaryotes (Practical Project) [T-CHEMBIO-100443]

Organisation: KIT Department of Chemistry and Biosciences
University

Part of: M-CHEMBIO-100233 - Project Module: Microbiology of Eukaryotes

Type	Credits	Grading	Version
Coursework (practical)	7 CP	pass/fail	1

Exams			
ST 2025	7104306	Microbiology of Eukaryotes (Practical Project)	Fischer
ST 2025	71MPRO-4306	Mikrobiology of Eukaryotes (Practical Project)	Fischer
WT 25/26	71MPRO-4306	Mikrobiologie der Eukaryoten (Pojektpraktikum)	Fischer

T 9.65 Module component: Molecular and Cell Biology in Plant/Pathogen Interactions (Practical Project) [T-CHEMBIO-113753]

Coordinators: Prof. Dr. Jörg Kämper
Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-106863 - Project Module: Molecular and Cell Biology in Plant/Pathogen Interactions

Type	Credits	Grading	Term offered	Expansion	Version
Coursework	7 CP	pass/fail	Each term	1 semesters	1

Exams			
ST 2025	71MPRO3320	Molecular and Cell Biology in Plant/Pathogen Interactions (Practical Project)	Kämper

T 9.66 Module component: Molecular and Cell Biology of Mycorrhiza [T-CHEMBIO-108653]

Coordinators: Prof. Dr. Natalia Requena Sanchez
Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-100200 - Research Module: Molecular and Cell Biology of Mycorrhiza

Type	Credits	Grading	Term offered	Version
Examination of another type	8 CP	graded	Each summer term	1

Exams			
ST 2025	71MFOR-2207	Molecular and Cell Biology of Mycorrhiza	Requena Sanchez

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Prerequisites
none

Workload
240 hours

T 9.67 Module component: Molecular and Cell Biology of Mycorrhiza (Practical Project) [T-CHEMBIO-100437]

Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-100218 - Project Module: Molecular and Cell Biology of Mycorrhiza

Type	Credits	Grading	Version
Coursework (practical)	7 CP	pass/fail	1

Exams			
ST 2025	71MPRO-2307	Molecular and Cell Biology of Mycorrhiza (Practical Project)	Requena Sanchez

T 9.68 Module component: Molecular Biology of the Cell [T-CHEMBIO-107046]

Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-103530 - Research Module: Molecular Biology of the Cell

Type	Credits	Grading	Term offered	Version
Examination of another type	8 CP	graded	Each winter term	1

Exams			
WT 25/26	71MFOR-5208	Molecular Biology of the Cell	Bastmeyer, Weth, Bentrop

Assessment
Success is assessed in the form of a different type of examination.
A total of 100 points can be earned.

- The first part of the examination is a 120-minute written test on the lecture and the content of the practical course. Up to 80 points can be achieved in this part of the examination.
- In addition to this written test, a report on the internship must be prepared, which must meet scientific standards. Up to 10 points are awarded for this report.
- A presentation must also be given. 10 points can also be awarded for this part.

Prerequisites
keine

Workload
240 hours

T 9.69 Module component: Molecular Biology of the Cell (Practical Project) [T-CHEMBIO-108075]

Coordinators: Prof. Dr. Martin Bastmeyer
Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-103942 - Project Module: Molecular Biology of the Cell

Type	Credits	Grading	Term offered	Version
Coursework (practical)	7 CP	pass/fail	Irregular	1

Exams			
ST 2025	71MPRO-5308	Molecular Biology of the Cell (Practical Project)	Bastmeyer, Bentrop, Weth
WT 25/26	71MPRO-5308	Molecular Biology of the Cell (Practical Project)	Bastmeyer, Bentrop, Weth

Prerequisites
none

Workload
210 hours

T 9.70 Module component: Molecular Cell Biology [T-CHEMBIO-108664]

Coordinators: Dr. habil. Dietmar Gradl
Prof. Dr. Ferdinand le Noble

Organisation: KIT Department of Chemistry and Biosciences

Part of: M-CHEMBIO-100226 - Research Module: Molecular Cell Biology

Type	Credits	Grading	Term offered	Version
Examination of another type	8 CP	graded	Each term	2

Exams			
ST 2025	71108664	Molecular Cell Biology	le Noble, Gradl

Assessment
Examination of a different kind

- Success is assessed in the form of a written examination lasting 120 minutes on the lecture and the content of the practical course - 80 points
- The contents of the practical course and the results of the experiments are discussed and reviewed in a presentation - 10 points
- The results are summarized in a protocol - 10 points

Prerequisites
none

Workload
240 hours

T 9.71 Module component: Molecular Cell Biology (Practical Project) [T-CHEMBIO-100444]

Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-100234 - Project Module: Molecular Cell Biology

Type	Credits	Grading	Version
Coursework (practical)	7 CP	pass/fail	1

Exams			
ST 2025	71MPRO-6301	Molecular Cell Biology (Practical Project)	le Noble, Gradl
WT 25/26	71MPRO-6301	Molekulare Zellbiologie (Projektpraktikum)	le Noble, Gradl

T 9.72 Module component: Molecular Developmental Neurobiology (Practical Project) [T-CHEMBIO-100484]

Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-100258 - Project Module: Molecular Developmental Neurobiology

Type	Credits	Grading	Version
Coursework (practical)	7 CP	pass/fail	1

Exams			
ST 2025	71MPRO-5307	Molecular Developmental Neurobiology (Practical Project)	Bentrop, Weth, Rastegar
WT 25/26	71MPRO-5307	Molekulare Neuroentwicklungsbiologie (Projektpraktikum)	Bastmeyer, Bentrop, Weth

Prerequisites
none

Additional Information
Information about the animals and their use:

Animals are used in this module. Zebrafish from the laboratory's own husbandry are mated to obtain embryos. Studies are carried out on these embryos up to an age of 5 dpf. Swabs can also be taken from the body surface of adult animals. Molecular biological and histological examinations are carried out on organs from laboratory-bred mice. Chicken eggs for embryo collection (E6 of 21) come from a commercial breeding farm. All husbandry and interventions are approved by the responsible regional council.

Reasons why the use of animals cannot be dispensed with in this module:

The development of the nervous system in vertebrates is based on complex interactions between the cell types involved. Often only some of the cell types or proteins involved have been identified. These questions cannot be fully investigated in in vitro culture systems because not all molecular parameters are known that would have to be reconstructed in these systems. Furthermore, the complex spatial environment in which nerve cells differentiate cannot be fully simulated in culture.

Information on the courses and performance assessments to which students can alternatively switch:

This is an elective course; students can alternatively take other PRO modules that do not involve working with animals.

T 9.73 Module component: Molecular Genetics of Lower Eukaryotes (Practical Project) [T-CHEMBIO-100442]

Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-100232 - Project Module: Genetics of Lower Eukaryotes

Type	Credits	Grading	Version
Coursework (practical)	7 CP	pass/fail	1

Exams			
ST 2025	71MPRO-4301	Molecular Genetics of Lower Eukaryotes (Practical Project)	Kämper
WT 25/26	71MPRO-4301	Molekulargenetik niederer Eukaryoten (Projektpraktikum)	Kämper

T 9.74 Module component: Molecular Mechanism of Bacterial Secretion Systems (Project Module) [T-CHEMBIO-114126]

Coordinators: Prof. Dr. Andreas Diepold
Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-107084 - Project Module: Molecular Mechanism of Bacterial Secretion Systems

Type	Credits	Grading	Term offered	Expansion	Version
Coursework	7 CP	pass/fail	Each term	1 semesters	1

Exams			
ST 2025	71MPRO3301	Molecular Mechanism of Bacterial Secretion Systems (Project Module)	Diepold
WT 25/26	71MPRO3301	Molecular Mechanism of Bacterial Secretion Systems (Project Module)	Diepold

Assessment
The project module is not graded. A qualitative assessment of success takes place in the form of a final presentation.

The success of the internship is reviewed through individual status discussions with the students and inspection of the results of the experiments.

Workload
210 hours

T 9.75 Module component: Molecular Methods in Higher Eukaryotes (Practical Project) [T-CHEMBIO-100441]

Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-100231 - Project Module: Molecular Methods in Higher Eukaryotes

Type	Credits	Grading	Version
Coursework (practical)	7 CP	pass/fail	1

Exams			
ST 2025	71MPRO-3311	Molecular Methods in Higher Eukaryotes (Projektpraktikum)	Schepers

T 9.76 Module component: Molecular Plant-Microbe Interactions [T-CHEMBIO-108654]

Coordinators: Prof. Dr. Natalia Requena Sanchez
Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-100201 - Research Module: Molecular Plant-Microbe Interactions

Type	Credits	Grading	Term offered	Version
Examination of another type	8 CP	graded	Each winter term	2

Assessment
Success is assessed in the form of a different type of examination
A total of 100 points can be earned.

- One part of the examination takes the form of a 120-minute written test on the lecture and the content of the practical course. This part of the examination can be used to achieve 80 points of the total number of points.
- In addition to this written test, a report on the internship must be prepared, which must meet scientific standards. 10 points can be obtained for this report.
- A presentation must also be given. 10 points can also be earned for this part.

Prerequisites
none

Workload
240 hours

T 9.77 Module component: Molecular Plant-Microbe Interactions (Practical Project) [T-CHEMBIO-100438]

Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-100219 - Project Module: Molecular Plant-Microbe Interactions

Type	Credits	Grading	Version
Coursework (practical)	7 CP	pass/fail	1

Exams			
ST 2025	71MPRO-2308	Molecular Plant-Microbe Interactions (Practical Project)	Requena Sanchez

T 9.78 Module component: Numerical Ecology and Macroecology [T-BGU-112640]

Coordinators: Prof. Dr. Sebastian Schmidtlein
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105575 - Ecology

Type	Credits	Grading	Term offered	Expansion	Version
Examination of another type	3 CP	graded	Each winter term	1 semesters	1

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

Prerequisites
None

Recommendations
None

Additional Information
None

Workload
90 hours

T 9.79 Module component: Pathophysiology, Molecular Basis of Diseases [T-CHEMBIO-106980]

Coordinators: Dr. habil. Dietmar Gradl
Prof. Dr. Ferdinand le Noble

Organisation: KIT Department of Chemistry and Biosciences

Part of: M-CHEMBIO-103501 - Research Module: Pathophysiology, Molecular Basis of Diseases

Type	Credits	Grading	Term offered	Version
Examination of another type	8 CP	graded	Each term	2

Exams			
ST 2025	71MFOR-6205	Pathophysiology, molecular basis of diseases	Gradl
WT 25/26	71MFOR-6205	Pathophysiology, molecular basis of diseases	le Noble, Gradl

Assessment
Examination of a different kind

- Success is assessed in the form of a written examination lasting 120 minutes on the lecture and the content of the practical course - 80 points
- The contents of the practical course and the results of the experiments are discussed and reviewed in a presentation - 10 points
- The results are summarized in a protocol - 10 points

Prerequisites
none

Workload
240 hours

T 9.80 Module component: Pathophysiology, Molecular Basis of Diseases (Practical Project) [T-CHEMBIO-111223]

Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-105600 - Project Module: Pathophysiology, Molecular Basis of Diseases

Type	Credits	Grading	Version
Coursework (practical)	7 CP	pass/fail	1

Exams			
ST 2025	71MPRO-6305	Pathophysiology, Molecular Basis of Diseases (Practical Project)	Gradl
WT 25/26	71MPRO-6305	Pathophysiology, Molecular Basis of Diseases (Practical Project)	Gradl

Prerequisites
none

T 9.81 Module component: Phenomics and Chemomics [T-CHEMBIO-108673]

Coordinators: Prof.Dr. Uwe Strähle
Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-103298 - Research Module: Phenomics and Chemomics

Type	Credits	Grading	Term offered	Version
Examination of another type	8 CP	graded	Each summer term	1

Exams			
ST 2025	71M-CHEMBIO-103298	Phenomics and Chemomics	Dickmeis

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Prerequisites
none

Workload
240 hours

T 9.82 Module component: Phenomics and Chemomics (Practical Project) [T-CHEMBIO-113722]

Coordinators: Dr. Thomas Dickmeis
Prof. Dr. Lennart Hilbert

Organisation: KIT Department of Chemistry and Biosciences

Part of: M-CHEMBIO-106841 - Project Module: Phenomics and Chemomics

Type	Credits	Grading	Term offered	Version
Coursework	7 CP	pass/fail	Each summer term	3

Exams			
ST 2025	7100043	Phenomics and Chemomics (Project Module)	Dickmeis, Hilbert

T 9.83 Module component: Photoreceptors in Plants and Microorganisms [T-CHEMBIO-108618]

Coordinators: Prof. Dr. Tilman Lamparter
Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-100195 - Research Module: Photoreceptors in Plants and Microorganisms

Type	Credits	Grading	Term offered	Version
Written examination	8 CP	graded	Each term	1

Prerequisites
none

Workload
240 hours

T 9.84 Module component: Planning of Scientific Project [T-CHEMBIO-114856]

Coordinators: Dozentinnen und Dozenten der Biologie
Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-107583 - Integrated Thinking - Planning of Scientific Project

Type	Credits	Grading	Expansion	Version
Examination of another type	9 CP	graded	1 semesters	1

Assessment
Other types of examination

A maximum of 100 points can be achieved. These are made up as follows:

- **Elaborated project plan**, min. 5 - max. 10 pages (without bibliography).
  Contains: Research question, state of research, experimental procedure plan with risk assessment, alternative approaches and a specified expected gain in knowledge, max. 50 points.
- **Final examination,** 45 minutes.
  Oral presentation of the project plan with subsequent discussion, max. 50 points.
  The final discussion is conducted by the first supervisor of the thesis in accordance with the guidelines of the SPO Master and the second examiner of the Master's thesis or an assessor who must have successfully completed at least the Master's examination (doctoral student, postdoc)

Workload
270 hours

T 9.85 Module component: Plant Cell Biology [T-CHEMBIO-108615]

Coordinators: Prof. Dr. Peter Nick
Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-100191 - Research Module: Plant Cell Biology

Type	Credits	Grading	Term offered	Version
Examination of another type	8 CP	graded	Each term	2

Exams			
ST 2025	71MFOR-1201	Plant Cell Biology	Nick
WT 25/26	71MFOR-1201	Plant Cell Biology	Nick

Prerequisites
keine

Workload
240 hours

T 9.86 Module component: Plant Developmental Biology [T-CHEMBIO-113846]

Coordinators: Dr. Jathish Ponnu
Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-106909 - Research Module: Plant Developmental Biology

Type	Credits	Grading	Term offered	Expansion	Version
Examination of another type	8 CP	graded	Each winter term	1 semesters	1

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Workload
210 hours

T 9.87 Module component: Plant Evolution [T-CHEMBIO-108616]

Coordinators: Prof. Dr. Peter Nick
Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-100192 - Research Module: Plant Evolution: Methods and Concepts

Type	Credits	Grading	Term offered	Version
Examination of another type	8 CP	graded	Each term	1

Exams			
ST 2025	71MFOR-1202	Plant Evolution	Nick

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Assessment
Success is assessed in the form of a different type of examination
A total of 120 points can be earned. These are made up of

- a written test of 120 minutes on the contents of the lecture. 60 points of the total number of points can be achieved with this test.
- Group exercises (individual input via Ilias). This can earn 18 points.
- In-depth exercises accompanying the lectures. This can earn 30 points.
- A report on the practical course, which must meet scientific standards. 8 points can be earned for this report.
- a project proposal, which must be developed according to scientific criteria. 4 points can be earned for this proposal.
- the presentation of the project in a lecture. A maximum grade bonus of 0.3 grade levels can be earned for good presentations

Successful participation in the internship is a necessary prerequisite for completing the module. This is documented by a countersigned acceptance report. In addition to regular attendance and compliance with safety regulations, the criteria for passing the module are that the documentation of experiments and data and the organization of samples meet scientific standards. If the acceptance report is not accepted, the internship is deemed to have been failed. Depending on the individual case, conditions are agreed that must be fulfilled before the examination can be accepted as passed.

Prerequisites
none

Workload
240 hours

T 9.88 Module component: Plant Gene Technology - Precise Genome Engineering [T-CHEMBIO-108629]

Coordinators: Dr. Fabienne Gehrke
Prof. Dr. Holger Puchta

Organisation: KIT Department of Chemistry and Biosciences

Part of: M-CHEMBIO-100198 - Research Module: Plant Gene Technology - Precise Genome Engineering

Type	Credits	Grading	Term offered	Version
Examination of another type	8 CP	graded	Each term	2

Exams			
ST 2025	71MFOR-2201	Plant Gene Technology - Precise Genome Engineering	Puchta, Schindele, Rönspies, Capdeville, Gehrke
WT 25/26	71MFOR-2201	Plant Gene Technology - Precise Genome Engineering	Puchta, Rönspies, Capdeville, Gehrke

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Assessment
The performance review is a different type of examination

A total of 100 points can be achieved. These are made up as follows:

- A written part (duration: 120 minutes) on the contents of the lecture - max. 80 points
- Participation in the practical course and the corresponding report - max. 10 points
- A lecture or presentation - max. 10 points

Prerequisites
none

Workload
240 hours

T 9.89 Module component: Plant Molecular Biology (Practical Project) [T-CHEMBIO-100420]

Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-100214 - Project Module: Plant Molecular Biology

Type	Credits	Grading	Version
Coursework (practical)	7 CP	pass/fail	1

Exams			
ST 2025	71MPRO-2300	Plant Molecular Biology (Practical Project)	Capdeville, Gehrke
WT 25/26	71MPRO-2300	Plant Molecular Biology (Projektpraktikum)	Gehrke, Rönspies, Capdeville, Puchta

T 9.90 Module component: Practical in Gene Technology (Practical Project) [T-CHEMBIO-100435]

Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-100228 - Project Module: Plant Gene Technology - Precise Genome Engineering

Type	Credits	Grading	Version
Coursework (practical)	7 CP	pass/fail	1

Exams			
ST 2025	71MPRO-2301	Plant Gene Technology - Precise Genome Engineering	Rönspies, Capdeville, Gehrke
WT 25/26	71MPRO-2301	Gentechnologisches Praktikum (Projektpraktikum)	Gehrke, Puchta, Rönspies, Capdeville

T 9.91 Module component: Practical Project Intensification of Bioprocesses [T-CIWVT-114319]

Coordinators: Dr. Anke Neumann
Organisation: KIT Department of Chemical and Process Engineering
Part of: M-CIWVT-107275 - Project Module: Intensification of Bioprocesses

Type	Credits	Grading	Term offered	Version
Examination of another type	14 CP	graded	Each summer term	1

Exams			
ST 2025	7212052-PP-BIO	Practical Project Intensification of Bioprocesses	Holtmann, Neumann

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

T 9.92 Module component: Productive Biofilms (Practical Project) [T-CHEMBIO-111231]

Coordinators: Dr. Gunnar Sturm
Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-105603 - Project Module:Productive Biofilms

Type	Credits	Grading	Term offered	Version
Coursework (practical)	7 CP	pass/fail	Each term	1

T 9.93 Module component: Project in Technical Biology (Practical Projekt) [T-CIWVT-100560]

Coordinators: Prof. Dr.-Ing. Dirk Holtmann
Organisation: KIT Department of Chemical and Process Engineering
Part of: M-CIWVT-100307 - Project Module: Project in Technical Biology

Type	Credits	Grading	Version
Coursework (practical)	7 CP	pass/fail	1

Exams			
ST 2025	7212176-PP-BIO	Project in Technical Biology (Practical)	Neumann, Holtmann
WT 25/26	7212176-PP-BIO	Project in Technical Biology (Practical Projekt)	Neumann, Holtmann

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

T 9.94 Module component: Quantitative Phenotyping in Breeding [T-CHEMBIO-113461]

Coordinators: Dr. Katja Herzog
Prof. Dr. Peter Nick

Organisation: KIT Department of Chemistry and Biosciences

Part of: M-CHEMBIO-106694 - Research Module: Quantitative Phenotyping in Breeding

Type	Credits	Grading	Term offered	Version
Examination of another type	8 CP	graded	Each summer term	1

Exams			
ST 2025	71MFOR1208	Quantitative Phenotyping in Breeding	Nick

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Assessment
The performance review is a different type of examination.

The assessment consists of three parts:

- 60 points of the total number of points via a written test (120 minutes) on the lecture and the contents of the practical course.
- 20 points by means of scientific protocols. You choose two focus topics (practical course).
- 20 points with a 10-minute impulse lecture on an experiment of the practical course.

Prerequisites
The module takes place at a different location: Julius Kühn Institute, Institute for Grapevine Breeding Geilweilerhof in Siebeldingen (with probably 3 attendance days per week!)

Additional Information
Summer semester: 2nd block

Module duration: 4 weeks all day

Workload:

Lecture: 15 h; 1 SWS; 1 CP

Practical course: 90 h; 6 SWS; 7 LP

Preparation and follow-up time:

Lecture: 15 h

Practical course: 120 h

Workload
240 hours

T 9.95 Module component: Registration for Certificate Issuance - Supplementary Studies on Science, Technology and Society [T-FORUM-113587]

Coordinators: Dr. Christine Mielke
Christine Myglas

Organisation: General Studies. Forum Science and Society (FORUM)

Part of: M-FORUM-106753 - Supplementary Studies on Science, Technology and Society

Type	Credits	Grading	Term offered	Version
Coursework	0 CP	pass/fail	Each term	1

Prerequisites
In order to register, it is mandatory that the basic module and the advanced module have been completed and that the grades for the partial performances in the advanced module are available.

Registration as a partial achievement means the issue of a certificate.

T 9.96 Module component: Research Based on Scientific Collections at the Natural History Museum (Practical Project) [T-CHEMBIO-114851]

Organisation: KIT Department of Chemistry and Biosciences

Part of: M-CHEMBIO-107582 - Project Module: Research Based on Scientific Collections at the Natural History Museum

Type	Credits	Grading	Version
Coursework	7 CP	pass/fail	1

Exams			
ST 2025	71MPRO-8302	Research Based on Scientific Collections at the Natural History Museum (Practical Project)	Husemann

Assessment
Final report

Workload
210 hours

T 9.97 Module component: Research Module: Introductory Course on Molecular Methods and Techniques Using Model Organisms (Propaedeutic Module) [T-CHEMBIO-114864]

Coordinators: Prof. Dr. Sylvia Erhardt
Prof. Dr. Jörg Kämper
Prof. Dr. Peter Nick

Organisation: KIT Department of Chemistry and Biosciences

Part of: M-CHEMBIO-107589 - Research Module: Introductory Course on Molecular Methods and Techniques Using Model Organisms (Propaedeutic Module)

Type	Credits	Grading	Term offered	Version
Examination of another type	8 CP	graded	Each winter term	1

Assessment
Success is assessed in the form of a different type of examination

A total of 100 points can be earned.

- One part of the examination takes the form of a written test lasting 80 minutes on lectures, preliminary discussions, presentations prepared by the students and the content of the internship. This part of the examination can be used to achieve 80 points of the total number of points.
- In addition to this written test, a report on the internship must be prepared, which must meet scientific standards. This report can be awarded 10 points.
- In addition, 10 points can be earned for a presentation prepared by the student on the methods, techniques and/or content of the internship.

Workload
240 hours

T 9.98 Module component: Research Projects in Plant Cell Biology (Practical Project) [T-CHEMBIO-100410]

Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-100202 - Project Module: Plant Cell Biology

Type	Credits	Grading	Version
Coursework (practical)	7 CP	pass/fail	1

Exams			
ST 2025	71MPRO-1301	Research Projects in Plant Cell Biology (Practical Project)	Nick

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

T 9.99 Module component: Research Projects in Plant Evolution (Practical Project) [T-CHEMBIO-100411]

Organisation: University
Part of: M-CHEMBIO-100203 - Project Module: Plant Evolution: Methods and Concepts

Type	Credits	Grading	Version
Coursework (practical)	7 CP	pass/fail	1

Exams			
ST 2025	71MPRO-1203	Research Projects in Plant Evolution (Practical Project)	Nick

T 9.100 Module component: Resilience - Plants Conquer Land [T-CHEMBIO-113638]

Coordinators: Dr. Gabriele Jürges
Prof. Dr. Peter Nick
Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-106787 - Research Module: Resilience - Plants Conquer Land

Type	Credits	Grading	Term offered	Expansion	Version
Written examination	8 CP	graded	Each winter term	1 semesters	1

Exams			
ST 2025	71MFOR1203	Resilience - Plants Conquer Land	Nick, Jürges

Assessment
Testing of a different kind

T 9.101 Module component: Seed Technology [T-CHEMBIO-108710]

Coordinators: Prof. Dr. Peter Nick
Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-100194 - Research Module: Seed Technology

Type	Credits	Grading	Term offered	Version
Examination of another type	8 CP	graded	Each summer term	1

Exams			
ST 2025	71108710	Seed Technology	Nick

Prerequisites
none

Workload
240 hours

T 9.102 Module component: Self Assignment - Interdisciplinary Seminar 1 (ungraded) [T-CHEMBIO-113901]

Coordinators: Dr. Urszula Weclawski
Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-100277 - Interdisciplinary Thinking

Type	Credits	Grading	Term offered	Version
Coursework	1 CP	pass/fail	Each winter term	1

Self Service Assignment of Supplementary Studies
This module component can be used for self service assignment of grades acquired from the following study providers:

- House of Competence
- Sprachenzentrum
- Studium Generale. Forum Wissenschaft und Gesellschaft (FORUM) (ehem. ZAK)

Workload
30 hours

T 9.103 Module component: Self Assignment - Interdisciplinary Seminar 2 (ungraded) [T-CHEMBIO-111731]

Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-100277 - Interdisciplinary Thinking

Type	Credits	Grading	Term offered	Version
Coursework	2 CP	pass/fail	Each winter term	2

Self Service Assignment of Supplementary Studies
This module component can be used for self service assignment of grades acquired from the following study providers:

- House of Competence
- Sprachenzentrum
- Studium Generale. Forum Wissenschaft und Gesellschaft (FORUM) (ehem. ZAK)

Workload
60 hours

T 9.104 Module component: Self Assignment - Interdisciplinary Seminar 3 (ungraded) [T-CHEMBIO-113902]

Coordinators: Dr. Urszula Weclawski
Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-100277 - Interdisciplinary Thinking

Type	Credits	Grading	Term offered	Version
Coursework	3 CP	pass/fail	Each winter term	1

Self Service Assignment of Supplementary Studies
This module component can be used for self service assignment of grades acquired from the following study providers:

- House of Competence
- Sprachenzentrum
- Studium Generale. Forum Wissenschaft und Gesellschaft (FORUM) (ehem. ZAK)

Workload
90 hours

T 9.105 Module component: Seminar Epigenetics and Genomics - Advanced Presentation Techniques [T-CHEMBIO-113223]

Coordinators: Prof. Dr. Sylvia Erhardt
Prof. Dr. Jörg Kämper
Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-100275 - Concept Development

Type	Credits	Grading	Version
Examination of another type	3 CP	graded	2

Exams			
WT 25/26	715405	Seminar Epigenetics and Genomics	Erhardt, Kämper

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Prerequisites
none

Workload
90 hours

T 9.106 Module component: Seminar Epigenetics and Genomics - Techniques of Information Management [T-CHEMBIO-113222]

Coordinators: Prof. Dr. Sylvia Erhardt
Prof. Dr. Jörg Kämper
Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-100275 - Concept Development

Type	Credits	Grading	Version
Examination of another type	3 CP	graded	1

Exams			
WT 25/26	715405	Seminar Epigenetics and Genomics	Erhardt, Kämper

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Prerequisites
none

Workload
90 hours

T 9.107 Module component: Seminar Food Chemistry - Presentation Skills [T-CHEMBIO-106144]

Coordinators: Prof. Dr. Andrea Hartwig
Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-100275 - Concept Development

Type	Credits	Grading	Term offered	Version
Examination of another type	3 CP	graded	Each term	1

Prerequisites
none

Workload
90 hours

T 9.108 Module component: Seminar Food Chemistry - Techniques of Information Management [T-CHEMBIO-106145]

Coordinators: Prof. Dr. Andrea Hartwig
Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-100275 - Concept Development

Type	Credits	Grading	Term offered	Version
Examination of another type	3 CP	graded	Each term	1

Prerequisites
none

Workload
30 hours

T 9.109 Module component: Seminar Molecular Genetics - Techniques of Information Management [T-CHEMBIO-100514]

Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-100275 - Concept Development

Type	Credits	Grading	Version
Examination of another type	3 CP	graded	2

Exams			
ST 2025	71MSQ01-R-4403	Molecular Genetics Techniques of Information Management	Kämper

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

T 9.110 Module component: Seminar Replication, Recombination & Reparation - Presentation Skills [T-CHEMBIO-100500]

Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-100275 - Concept Development

Type	Credits	Grading	Version
Examination of another type	3 CP	graded	2

Exams			
ST 2025	71MSQ01-P-2402	Seminar Replication, Recombination & Reparation - Presentation Skills	Capdeville, Puchta, Gehrke, Rönspies

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

T 9.111 Module component: Signal Transduction in Eukaryotic Systems (Practical Project) [T-CHEMBIO-100439]

Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-100229 - Project Module: Signal Transduction in Eukaryotic Systems

Type	Credits	Grading	Version
Coursework (practical)	7 CP	pass/fail	1

Exams			
ST 2025	71MPRO-3309	Signal Transduction in Eukaryotic Systems (Practical Project)	Orian-Rousseau, Weiss, Hilbert

T 9.112 Module component: Signaling in Cancer - Techniques of Information Management [T-CHEMBIO-103071]

Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-100275 - Concept Development

Type	Credits	Grading	Version
Examination of another type	3 CP	graded	2

Prerequisites
none

Workload
90 hours

T 9.113 Module component: Signaltransduction and Gene Regulation I [T-CHEMBIO-108659]

Coordinators: Prof. Dr. Jörg Kämper
Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-100222 - Research Module: Signal Transduction and Gene Regulation I

Type	Credits	Grading	Term offered	Version
Examination of another type	8 CP	graded	Each winter term	1

Exams			
WT 25/26	71MFOR-3204	Signaltransduction and Gene Regulation I	Kämper

Assessment
The control of success takes place in the form of an examination performance of a different kind
A total of 100 points can be acquired.

- One part of the examination takes the form of a written test lasting 90 minutes, on the lecture and the contents of the internship. About this part of the examination 80 points of the total score can be achieved.
- In addition to this written test, a report on the internship must be prepared, which must meet scientific standards. For this protocol 10 points can be obtained.
- Furthermore, 10 points can be earned through a presentation prepared by the student on methods, techniques and/or contents of the internship.

Prerequisites
none

Workload
240 hours

T 9.114 Module component: Signaltransduction und Gene Regulation II [T-CHEMBIO-108660]

Coordinators: Prof. Dr. Ute Schepers
Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-100223 - Research Module: Signal Transduction and Gene Regulation II

Type	Credits	Grading	Term offered	Version
Examination of another type	8 CP	graded	Each summer term	1

Exams			
ST 2025	71108660	Signaltransduction und Gene Regulation II	Kassel

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Prerequisites
none

Workload
240 hours

T 9.115 Module component: Systemic cellular neurobiology (Practical Project) [T-CHEMBIO-113738]

Coordinators: Prof. Dr. Simone Mayer
Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-106854 - Project module: Systemic Cellular Neurobiology

Type	Credits	Grading	Term offered	Expansion	Version
Coursework	7 CP	pass/fail	Each term	1 semesters	1

Exams			
ST 2025	71MPRO5320	Systemic cellular neurobiology (Project Module)	Mayer

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Assessment
Study Achievement: Report

Prerequisites
Knowledge in neurobiology and developmental biology

Additional Information
Please get in touch at least 8 weeks before the desired start of the module

Workload
178 hours

T 9.116 Module component: Systems Biology & Biophysics (Practical Project) [T-CHEMBIO-110791]

Coordinators: Prof. Dr. Lennart Hilbert
Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-105305 - Project Module: Systems Biology & Biophysics

Type	Credits	Grading	Version
Coursework (practical)	7 CP	pass/fail	1

Exams			
ST 2025	71MPRO5309	Systems Biology & Biophysics (Practical Project)	Hilbert
WT 25/26	71MPRO5309	Systems Biology & Biophysics (Practical Project)	Hilbert

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

T 9.117 Module component: Techniques in Microscopy [T-CHEMBIO-108676]

Coordinators: Prof. Dr. Martin Bastmeyer
Dr. Franco Weth

Organisation: KIT Department of Chemistry and Biosciences

Part of: M-CHEMBIO-100248 - Research Module: Techniques in Microscopy

Type	Credits	Grading	Term offered	Version
Examination of another type	8 CP	graded	Each summer term	1

Exams			
ST 2025	71MFOR-5206	Techniques in Microscopy	Bastmeyer

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Prerequisites
none

Workload
240 hours

T 9.118 Module component: Theory of Science and Ethics - Presentation Skills [T-CHEMBIO-100490]

Coordinators: Prof. Dr. Peter Nick
Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-100275 - Concept Development
M-CHEMBIO-100275 - Concept Development

Type	Credits	Grading	Version
Examination of another type	3 CP	graded	2

Exams			
ST 2025	71MSQ01-P-1404	Theory of Science and Ethics - Presentation Skills	Nick

Prerequisites
none

Recommendations
https://www.jkip.kit.edu/botzell/992.php

Additional Information
Language:
Winter semester - German
Summer semester - English

T 9.119 Module component: Tissue Engineering and 3D Cell Culture [T-CHEMBIO-108667]

Coordinators: Prof. Dr. Ute Schepers
Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-101596 - Research Module: Tissue Engineering and 3D Cell Culture

Type	Credits	Grading	Term offered	Version
Written examination	8 CP	graded	Each summer term	1

Exams			
WT 25/26	71MFOR-3207_Nachblock	Tissue Engineering and 3D Cell Culture	Schepers

Prerequisites
none

Workload
240 hours

T 9.120 Module component: Tissue Engineering and 3D Cell Culture (Practical Project) [T-CHEMBIO-103059]

Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-101597 - Project Module: Tissue Engineering and 3D Cell Culture

Type	Credits	Grading	Version
Coursework (practical)	7 CP	pass/fail	1

Exams			
ST 2025	71MPRO-3307	Tissue Engineering and 3D Cell Culture (Practical Project)	Schepers
WT 25/26	71MPRO-3307	Tissue Engineering and 3D Cell Culture (Practical Project)	Schepers

Prerequisites
none

Workload
210 hours

T 9.121 Module component: Toxicology (Laboratory Practical Course) [T-CHEMBIO-111326]

Coordinators: PD Dr. Beate Monika Köberle
Dr. Carsten Weiss

Organisation: KIT Department of Chemistry and Biosciences

Part of: M-CHEMBIO-105673 - Research and Project Module: Toxicology and Food Toxicology

Type	Credits	Grading	Version
Coursework (practical)	10 CP	pass/fail	2

Prerequisites
none

Workload
330 hours

T 9.122 Module component: Toxicology and Food Toxicology [T-CHEMBIO-111325]

Coordinators: PD Dr. Beate Monika Köberle
Dr. Carsten Weiss
Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-105673 - Research and Project Module: Toxicology and Food Toxicology

Type	Credits	Grading	Term offered	Version
Examination of another type	7 CP	graded	Each summer term	4

Exams			
ST 2025	71MFOR8201_a	Toxicology and Food Toxicology	Köberle, Hartwig

Prerequisites
Registration for the lecture T-CHEMBIO-10446 Lebensmitteltoxikologie

Modeled Prerequisites
The following conditions have to be fulfilled:

1. The module component T-CHEMBIO-104464 - Food Toxicology must have been started.

Workload
240 hours

T 9.123 Module component: Transcriptomic analysis [T-CHEMBIO-113843]

Coordinators: Prof. Dr. Simone Mayer
Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-106907 - Research Module: Transcriptomic Analysis

Type	Credits	Grading	Term offered	Expansion	Version
Examination of another type	8 CP	graded	Each winter term	1 semesters	2

Exams			
WT 25/26	71MFOR-5206	Transcriptomic analysis	Mayer

Assessment
Success is assessed in the form of a different type of examination.
A total of 100 points can be earned.

- One part of the examination takes the form of a written test on the lecture and the content of the practical course. This part of the examination can be used to achieve 80 points of the total number of points.
- In addition to this written test, a report on the internship must be prepared, which must meet scientific standards. 10 points can be obtained for this report.
- A presentation must also be given. 10 points can also be earned for this part.

Workload
240 hours

T 9.124 Module component: Vegetation and Landscape Development of Baden-Württemberg [T-CHEMBIO-114812]

Coordinators: Maren Riemann
Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-107557 - Research Module: Vegetation and Landscape Development of Baden-Württemberg

Type	Credits	Grading	Term offered	Version
Examination of another type	8 CP	graded	Each winter term	1

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Assessment
The examination is a different type of examination and consists of two parts:
Written examination on the lecture (40 points) and final presentation on the practical part (10 points). A maximum of 50 points can be achieved in total

Prerequisites
Botanical identification exercises

Workload
240 hours

T 9.125 Module component: Vegetation Ecology [T-BGU-102982]

Coordinators: Dr. rer. nat. Anne Lewerentz
Prof. Dr. Sebastian Schmidtlein

Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences

Part of: M-BGU-105575 - Ecology

Type	Credits	Grading	Term offered	Version
Examination of another type	3 CP	graded	Each winter term	2

Exams			
WT 25/26	8267102982	Vegetation Ecology	Schmidtlein, Lewerentz

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Prerequisites
None

Recommendations
None

Additional Information
None

Workload
90 hours

T 9.126 Module component: Vegetation Science [T-BGU-109123]

Coordinators: Prof. Dr. Sebastian Schmidtlein
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105575 - Ecology

Type	Credits	Grading	Term offered	Version
Written examination	3 CP	graded	Each summer term	1

Exams			
ST 2025	8262109123_1	Vegetation Science	Schmidtlein
WT 25/26	8262109123_2	Vegetation Science	Schmidtlein

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Assessment
computer-aided written exam with 60 minutes in ILIAS

Recommendations
none

Additional Information
none

Workload
90 hours

T 9.127 Module component: Vegetation Survey and Mapping [T-BGU-112637]

Coordinators: Dr. Michael Ewald
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105575 - Ecology

Type	Credits	Grading	Term offered	Expansion	Version
Examination of another type	4 CP	graded	Each summer term	1 semesters	1

Exams			
ST 2025	8267112637	Vegetation Survey and Mapping	Ewald

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Prerequisites
None

Recommendations
None

Additional Information
None

Workload
120 hours

T 9.128 Module component: Wildcard [T-CHEMBIO-105810]

Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-100275 - Concept Development

Type	Credits	Grading	Version
Examination of another type	3 CP	graded	1