Georg-August-Universität
Göttingen

Directory of Modules

zu der Prüfungs- und Studienordnung für den konsekutiven Master-Studiengang "Molecular Life Sciences: Microbiology, Biotechnology and Biochemistry" (Amtliche Mitteilungen I 29/2021 S. 617; zuletzt geaendert durch Amtliche Mitteilungen I Nr. 35/2024 S. 852)

Modules

Index by areas of study

I. Master's Degree Programme "Molecular Life Sciences: Microbiology, Biotechnology and Biochemistry"

120 C must be acquired in accordance with the following provisions.

Es müssen nach Maßgabe der nachfolgenden Bestimmungen 120 C erworben werden.

1. Professional Studies

Modules totalling at least 60 C must be successfully completed in accordance with the following provisions.

Es müssen Module im Umfang von insgesamt wenigstens 60 C nach Maßgabe der nachfolgenden Bestimmungen erfolgreich absolviert werden.

a. Core Modules

Three of the following core modules totalling 36 C must be successfully completed:

Es müssen drei der folgenden Fachmodule im Umfang von insgesamt 36 C erfolgreich absolviert werden:

b. Advanced Modules

Two of the following advanced modules totalling 24 C must be successfully completed:

Es müssen zwei der folgenden Vertiefungsmodule im Umfang von insgesamt 24 C erfolgreich absolviert werden:

2. Area of Professionalisation

Compulsory and elective modules totalling at least 30 C must be successfully completed in accordance with the following provisions.

Es müssen Pflicht- und Wahlpflichtmodule im Umfang von insgesamt wenigstens 30 C nach Maßgabe der nachfolgenden Bestimmungen erfolgreich absolviert werden.

a. Profile Module

One of the following modules, comprising at least 12 credits, must be successfully completed. Alternatively, a core module under No. 1. a. that has not yet been taken, any core module from the Master's programme "Developmental, Neural, and Behavioral Biology", or a module from the Master's programme "Chemistry" may be taken.

If the profile module is to be composed of several modules or if modules outside the Faculty of Biology and Psychology are to be taken, this requires the approval of the Examination Board.

Es muss eins der folgenden Module im Umfang von mindestens 12 C erfolgreich absolviert werden. Stattdessen kann ein noch nicht belegtes Fachmodul nach Nr. 1 Buchstabe a. oder ein beliebiges Fachmodul des Master-Studiengangs "Developmental, Neural, and Behavioral Biology" oder ein Modul des Master-Studiengangs "Chemie" belegt werden.

Soll das Profilmodul aus mehreren Modulen zusammengesetzt werden oder sollen Module außerhalb der Fakultät für Biologie und Psychologie belegt werden, bedarf dies der Genehmigung durch die Prüfungskommission.

b. Elective Modules

A total of at least 6 C credits must be successfully completed. Students may choose modules from the elective modules of "Key Competencies" listed under No. 2. c. as well as the modules listed below, provided these have not already been completed in another area. A reasoned application for the recognition of further modules, e.g. from the range offered by the faculties of mathematics and natural sciences, may be submitted to the Examination Board.

Es müssen Module im Umfang von insgesamt wenigstens 6 C erfolgreich absolviert werden. Dabei können Wahlmodule der "Key Competencies" nach Nr. 2 Buchstabe c. sowie nachfolgende Module gewählt werden, sofern sie noch nicht in einem anderen Bereich absolviert wurden. Die

Anerkennung weiterer Module, z.B. aus dem Angebot der mathematisch-naturwissenschaftlichen Fakultäten kann bei der Prüfungskommission begründet beantragt werden.

c. Key Competencies

Students must complete modules totalling 12 credits, including the compulsory module M.Bio.131. Modules from the university-wide key competencies programme are suitable for this purpose, as are the following modules, provided they have not already been completed in another area.

Es müssen Module im Umfang von insgesamt 12 C absolviert werden, darunter das Pflichtmodul M.Bio.131. Hierbei eignen sich Module des universitätsweiten Schlüsselkompetenzangebots sowie folgende Module, sofern sie noch nicht in einem anderen Bereich absolviert wurden.

3. Master's Thesis

The successful completion of the Master's thesis earns 30 C.

Durch die erfolgreiche Anfertigung der Masterarbeit werden 30 C erworben.

Georg-August-Universität Göttingen **Module B.Che.3901: Computer Applications in Chemistry**	4 C 6 WLH

Learning outcome, core skills: Nach erfolgreichem Abschluss des Moduls • haben die Studierenden vertiefte Kenntnisse in den Betriebssystemen Unix/ Windows (Standard-Datenformate, Netzwerke, Skriptsprachen und elementare Programmierung) erlangt. • besitzen die Teilnehmenden die notwendigen Kenntnisse, um Abschlussarbeiten/ wissenschaftliche Publikationen mittels eines Textverarbeitungsprogrammes selbstständig und effizient anfertigen zu können. • sind die Studierenden in der Lage, Messergebnisse auswerten und graphisch darstellen zu können; • kennen Teilnehmenden die gängigen chemiespezifischen Programme zur Darstellung chemischer Strukturen und Spektren und verfügen über ein Verständnis für deren Funktionsweise. • können die Studierenden selbstständig Literaturrecherchen durchführen. • ist es ihnen möglich, einfache Probleme mit Hilfe symbolischer Algebra und numerischer Standardverfahren zu lösen. • besitzen sie die Fähigkeit, eigene Probleme und Fragestellungen derart zu konkretisieren, dass sie für eine Bearbeitung am Computer geeignet sind. • können sie die Eignung von Programmen für die Lösung eines eigenen Problems beurteilen. ACHTUNG: Das Modul wird in diesem Semester nicht angeboten. Es kann durch das Modul B.Che.3914 „Computergestützte Datenanalyse" ersetzt werden.	**Workload:** Attendance time: 84 h Self-study time: 36 h

Course: Seminar + Übungen am Computer	6 WLH
Examination: Written examination (120 minutes), not graded	4 C

Examination requirements: statistische Auswertung von Messergebnissen, chemierelevante Computergraphik, Literaturrecherchen	

Admission requirements: none	**Recommended previous knowledge:** none
Language: German	**Person responsible for module:** Prof. Dr. Ricardo Andre Fernandes da Mata
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:**
Maximum number of students:	

23	

Additional notes and regulations:
ACHTUNG: Das Modul wird in diesem Semester nicht angeboten. Es kann durch das Modul B.Che.3914 „Computergestützte Datenanalyse" ersetzt werden.

Georg-August-Universität Göttingen **Module B.Che.3903: Environmental Chemistry**	3 C 2 WLH

Learning outcome, core skills: Die Studierenden erlernen die chemische Grundlagen der Umweltchemie zu den Themen Treibhausgase, Ozonproblematik, natürliche und anthropogene Prozesse, Schadstoffe in der Luft, im Wasser und im Boden, Wasserbehandlung, Energie und Treibstoffe.	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Umweltchemie (Lecture,Exercise)	2 WLH
Examination: Written examination (120 minutes) **Examination prerequisites:** 50% der max. möglichen Punkte aus der aktiven Teilnahme an den Übungen **Examination requirements:** Die Chemie, die sich in unserer Umwelt abspielt, soll mit Hilfe von Reaktionsgleichungen, Struktur und Bindung, und grundlegenden chemischen Konzepten interpretiert werden.	3 C

Admission requirements: none	**Recommended previous knowledge:** B.Che.1001
Language: German	**Person responsible for module:** Prof. Dr. Sven Schneider
Course frequency: each summer semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** 4 - 6
Maximum number of students: 120	

Additional notes and regulations: Wiederholbarkeit für BSc Biochemie: zweimalig

Georg-August-Universität Göttingen **Module M.Bio.001: Statistics for Biology using R**	6 C 4 WLH

Learning outcome, core skills: Students understand the concept of a random variable and its relation to empirical research in the bio-sciences. They understand probability distributions, distribution parameters like mean and variance and the difference between true values of these parameters and their estimates from samples. They understand the logic behind null-hypothesis tests. They understand the difference between parametric and non-parametric tests. They are able to select are suitable test for two-sample problems concerning the mean and the median, and to solve linear and multilinear regression problems. They are able to perform these analyses in R. **Contents:** 1. why statistics is necessary in bio-sciences 2. random variables, random variates (realizations), sampling 3. probability distributions and probability density functions, cumulative probability functions 4. descriptive statistics: measures of central tendencies, i.e. mean, mode(s), median; measures of variance; true values the difference between distribution parameters and their sample-based estimates 5. confidence intervals based on the bootstrap 6. statistical hypotheses, the corresponding null-hypotheses, the logic of null-hypothesis significance tests (NHSTs). 7. permutation testing for comparing means – unpaired tests 8. permutation testing for comparing means – paired tests. 9. correlation and univariate (linear) regression, resampling tests for univariate regression 10. the logic of parametric null hypothesis testing 11. parametric tests for multivariate regression 12. parametric tests for analysis of variance (ANOVA) parametric tests	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Statistics for Biology using R (Lecture)	2 WLH
Examination: Written E-examination in ILIAS (90 minutes) **Examination prerequisites:** Regular participation in the tutorial sessions	6 C

Course: Statistics for Biology using R (Tutorial)	2 WLH

Examination requirements: • Formulating nullhypotheses and alternative hypotheses and understanding their meaning • Loading and selecting data for analysis in R • running multiple regression in R • being able to interpret the outout of lm() in R • Interpreting p-values, regression coefficients, R and F-values correctly	

• Transferring the outcomes of an analysis in R into a written text describing the statistical findings	

Admission requirements: For master students only. The modules M.Bio.001 and B.Bio.107 are mutually exclusive.	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Michael Wibral
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** from 1
Maximum number of students: 65	

Georg-August-Universität Göttingen **Module M.Bio.101: General and Applied Microbiology**	12 C 14 WLH

Learning outcome, core skills: Students are able to analyse evolutionary and phylogenetic relationships of bacteria and archaea, explain cellular and molecular processes, and independently apply biomolecular, genetic, and biochemical techniques. They analyse microbial communities, metabolic diversity, and pathogenicity mechanisms and explain their relevance for biotechnology and medicine. They critically evaluate scientific publications, integrate current research findings, and present their insights in a structured, scientifically sound manner. The students actively contribute to scholarly discussions, analyse complex topics from multiple perspectives and apply effective communication strategies to support collaborative work.	**Workload:** Attendance time: 196 h Self-study time: 164 h

Course: General and Applied Microbiology (Lecture) *Contents*: • Evolution and phylogenetic system • Morphology and cell biology • Communities and biocoenosis of bacteria and archaea • Gene expression and molecular control (transcription, translation) • Posttranslational control, protein stability and proteomics • Genetic networks • Molecular switches and signal transduction • Microbial developmental biology • Mechanisms of pathogenicity of important pathogens • Development of new antimicrobial agents • Diversity of the metabolism in bacteria and archaea as basis for biotechnological applications • Industrial microbiology	3 WLH
Examination: Written examination (90 minutes) **Examination prerequisites:** Regular participation in seminar and methods course; certified methods course report (max. 10 pages) and successful seminar presentation (approx. 15 minutes). The seminar presentation can earn up to 10% of the total points for the exam in advance.	12 C

Course: Seminar on General and Applied Microbiology (Seminar)	1 WLH

Course: Isolation and Characterisation of Biotechnologically Relevant Microorganisms (methods course) (Practical course) or	10 WLH

Course: Signal Transduction in Bacteria (methods course) (Practical course)	10 WLH

Examination requirements: Students demonstrate their competences through a written exam, a structured laboratory report, and a scientific seminar presentation.	

The exam assesses theoretical understanding of molecular, genetic, and cellular principles; the lab report evaluates practical application and documentation of methods; and the presentation assesses critical literature analysis and scientific communication skills. All components are assessed jointly and reflect the student's subject-specific, methodological, and communicative competence.	

Admission requirements: cannot be combined with M.Bio.141	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Jörg Stülke
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 48	

Georg-August-Universität Göttingen **Module M.Bio.102: Molecular Genetics and Microbial Cell Biology**	12 C 14 WLH

Learning outcome, core skills: Students can independently apply molecular biological, genetic and cell biological methods to model organisms in molecular mycology (yeasts and filamentous fungi) and interpret the results in a scientific context. They plan, carry out and document research-related experiments in small groups, apply specific methods such as transformation, DNA isolation, PCR, fluorescence microscopy, cloning and protein purification, and reflect on methodological decisions and the biological relevance of the results. They analyse current research questions in molecular genetics and cell biology, synthesise scientific literature and present their findings in a structured, scientifically sound review paper. They analyse complex topics from multiple perspectives, communicate effectively in collaborative settings, and develop well-reasoned, constructive solutions together.	**Workload:** Attendance time: 196 h Self-study time: 164 h

Course: Molecular Genetics and Microbial Cell Biology (Lecture)	3 WLH
Course: Seminar on Molecular Genetics and Microbial Cell Biology (Seminar)	1 WLH

Course: Methods Course Molecular Genetics and Microbial Cell Biology (Practical course)	10 WLH

Examination: Written examination (90 minutes) **Examination prerequisites:** Regular participation in seminar and methods course; certified methods course report (max. 10 pages) and successful seminar presentation (approx. 15 minutes). The seminar presentation can earn up to 10% of the total points for the exam in advance.	

Examination requirements: The assessment consists of a written exam covering the lecture content, a scientific seminar presentation on an independently researched topic, and a structured practical laboratory report documenting experimental procedures, results, and their interpretation. The exam evaluates theoretical understanding, the presentation assesses scientific communication and literature analysis, and the lab report assesses practical application, documentation, and methodological reflection. All components are considered collectively in the final assessment.	

Admission requirements: cannot be combined with M.Bio.142, M.Bio.162 or M.Bio.172	**Recommended previous knowledge:** • Watson, Molecular Biology of the Gene, Pearson, 7th Edition; • Alberts, Molecular Biology of the Cell, Wiley, 7th Edition
Language: English	**Person responsible for module:** Prof. Dr. Stefanie Pöggeler

Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 24	

Georg-August-Universität Göttingen **Module M.Bio.104: Molecular Cell Biology of Plant-Microbe Interactions and Stress Adaptation**	12 C 14 WLH

Learning outcome, core skills: Upon completion of the module, students will be familiar with fundamental concepts of plant-microbe interactions at the cellular and molecular level and will be able to apply and evaluate various analytical methods of plant-microbe interactions. They will be able to investigate plant adaptation mechanisms to abiotic stress factors using appropriate methods. They will understand the results of current and relevant publications and will be able to present and critically discuss them.	**Workload:** Attendance time: 147 h Self-study time: 213 h

Course: Plant-Microbe Interactions (Lecture) *Contents*: • Plant-microbe interactions: models, defense mechanisms, PAMP- and effector-induced immunity • Resistance to biotrophic and necrotrophic pathogens • Hormone-dependent signaling pathways, systemically acquired resistance • Plant responses to abiotic stress (drought, heat) • Gene regulatory networks, stress memory	3 WLH
Course: Plant-Microbe Interactions (Seminar)	1 WLH

Course: Methods Course: Plant-Microbe Interactions (Practical course) *Contents*: • Pathogen infection, detection, and quantification (staining, microscopy, colony/ spore counting) • Analysis of basal defense responses after PAMP stimulation (receptor activation, ROS, MAP kinases) • Effector-mediated immunity (e.g., cell death detection) • Transient gene expression in protoplasts • Visualization of GFP-labeled proteins (fluorescence, confocal microscopy) • Physiological assays for drought and heat stress • qRT-PCR for gene expression analysis • DNA-protein interactions (EMSA, Yeast-one-hybrid) • Influence of beneficial microbes on root development and stress adaptation	10 WLH

Examination: Written examinationon the content of lecture and methods course (90 minutes) **Examination prerequisites:** Regular participation in seminar and methods course; seminar presentation (approx. 15 min)	12 C

Examination requirements: The exam tests the extent to which students understand the basic concepts and analytical methods of plant-microbe interactions and plant adaptation mechanisms to abiotic stress factors and can summarize them concisely.	

Admission requirements: cannot be combined with M.Bio.144	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Volker Lipka
Course frequency: each summer semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 18	

Georg-August-Universität Göttingen **Module M.Bio.105: Applied Bioinformatics in Molecular Biosciences**	12 C 14 WLH

Learning outcome, core skills: Students are able to apply bioinformatics methods and tools for the analysis of omics data (e.g., genomics, transcriptomics, proteomics, metabolomics) and justify their use in molecular phylogeny, evolution, genome dynamics, and systems biological research. They conduct sequence analyses of RNA and proteins, identify functional motifs and genes, construct and validate metabolic models and networks, and integrate and visualise large-scale datasets. Furthermore, they present their methodological approaches and results in a clear, structured scientific presentation, critically engage with academic publications, and actively contribute to scholarly discussions. They analyse complex topics from multiple perspectives, apply effective communication strategies to support collaborative work, present well-reasoned arguments, and work jointly to develop informed and constructive solutions.	**Workload:** Attendance time: 196 h Self-study time: 164 h

Course: Applied Bioinformatics in Molecular Biosciences (Lecture)	3 WLH
Course: Seminar on Applied Bioinformatics in Molecular Biosciences (Seminar)	1 WLH

Course: Methods Course Applied Bioinformatics in Molecular Biosciences (Internship)	10 WLH

Examination: Presentation (approx. 30 minutes) on methods and results of the practical course [80% of the overall grade] and seminar presentation (approx. 15 minutes) [20% of the overall grade] **Examination prerequisites:** regular attendance, certified protocol or manuscript **Examination requirements:** Students demonstrate their understanding and ability to apply bioinformatics methods in the key areas of (meta)omics analyses, motif recognition, and metabolic network modelling through the independent execution and interpretation of data analyses. They present their results in a scientifically rigorous and reflective manner, clearly communicating key aspects of methodology, data interpretation, and biological relevance. Furthermore, they are able to critically evaluate scientific publications and effectively present their content in a structured seminar talk.	12 C

Admission requirements: knowledge of Linux, B.Bio-NF117 or equivalent	**Recommended previous knowledge:** knowledge of Python and R
Language: English	**Person responsible for module:** Prof. Dr. Rolf Daniel
Course frequency: 1	**Duration:** 1 semester[s]
Number of repeat examinations permitted:	**Recommended semester:**

twice	
Maximum number of students: 10	

Georg-August-Universität Göttingen **Module M.Bio.106: Structural Biochemistry**	12 C 14 WLH

Learning outcome, core skills: Students are able to analyse the structure and function of biological macromolecules, particularly proteins, and explain the relationships between structure, folding, and function. They describe structure-function relationships in protein-protein and protein-nucleic acid interactions, apply principles of molecular recognition, and explain approaches to structure-based drug design. Furthermore, they are able to apply modern methods of structural biochemistry, use state-of-the-art equipment appropriately, critically analyse experimental data, and present findings in a scientific format. Students independently acquire specialised knowledge from current scientific publications, actively contribute to scholarly discussions, and reflect on recent developments in biochemistry. They analyse complex topics from multiple perspectives, apply effective communication strategies to support collaborative work, present well-reasoned arguments, and work jointly to develop informed and constructive solutions.	**Workload:** Attendance time: 196 h Self-study time: 164 h

Course: Structural Biochemistry (Lecture)	3 WLH
Course: Seminar on Structural Biochemistry (Seminar)	1 WLH

Course: Methods Course Structural Biochemistry (Practical course) *Contents*: Preparation of recombinant proteins using affinity, ion exchange and gel filtration chromatography as well as ultracentrifugation, characterisation of recombinant proteins and macromolecular complexes (gel electrophoresis, spectroscopic methods), biochemical analysis of protein-RNA complexes, crystallisation of proteins. Structural elucidation of biological macromolecules using X-ray crystallography and cryo-electron microscopy. Studies on the dynamics and function of macromolecular machines.	10 WLH

Examination: Written examination on content of lecture (90 min) [80% of overall grade]; seminar presentation (ca. 15 min) and protocol (max. 20 pages) [20% of overall grade] **Examination prerequisites:** regular participation in seminar and methods course; certified protocol	12 C

Examination requirements:	

Admission requirements: cannot be combined with M.Bio.156, M.Bio.166 or M.Bio.176	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Ralf Ficner
Course frequency: each summer semester	**Duration:** 1 semester[s]

Number of repeat examinations permitted: twice	**Recommended semester:** 1
Maximum number of students: 20	

Georg-August-Universität Göttingen **Module M.Bio.107: Biochemistry and Biophysics**	12 C 14 WLH

Learning outcome, core skills: Students are able to describe the structure, function, and biophysics of selected biomolecule classes and explain the role of lipids as signalling molecules, as well as the significance of secondary metabolites in plant metabolism. They analyse primary and secondary metabolism, identify functions and regulation of enzymes in lipid metabolism, and evaluate biotechnological approaches for modifying storage compounds. Furthermore, they apply modern biophysical methods for the analysis of biomolecules, use state-of-the-art equipment appropriately, and document experimental results critically and precisely. Students independently acquire specialised knowledge from scientific publications, critically analyse complex experiments, and present their findings in a scientifically sound manner.	**Workload:** Attendance time: 196 h Self-study time: 164 h

Course: Biochemistry and Biophysics (Lecture)	3 WLH
Course: Tutorial on Biochemistry and Biophysics (Tutorial)	1 WLH

Course: Methods Course Biochemistry and Biophysics (Practical course) *Contents*: Biochemical analysis of secondary metabolites, lipids, proteins, and nucleic acids using photometric tests, electrophoresis, thin-layer chromatography, and fully automated analytical instruments (HPLC/GC/GCMS). Spectroscopy on biomolecules (fluorescence, FT-IR, CD, UV/Vis), modern microscopic methods (optical microscopy, scanning probe methods), functional analyses of various classes of membrane proteins.	10 WLH

Examination: Written exam on content of lecture (90 Minuten) [80% of overall grade], and protocol (max. 20 pages) [20% of overall grade] **Examination prerequisites:** regular participation in methods course and certified protocol	12 C

Examination requirements: Students describe the structure and function of biomolecules, analyse metabolic pathways and the role of lipids and secondary metabolites, identify enzyme functions in lipid metabolism, and evaluate biotechnological approaches. The examination is written and tests understanding, analysis, and critical evaluation using case studies and data. They critically analyse complex experiments in a report and present their findings in a scientifically sound manner.	

Admission requirements: cannot be combined with M.Bio.157 or M.Bio.167	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Ivo Feußner
Course frequency:	**Duration:**

each summer semester	1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 48	

Georg-August-Universität Göttingen **Module M.Bio.108: Enzyme Catalysis and Biological Chemistry**	12 C 14 WLH

Learning outcome, core skills: Students are able to explain and apply catalytic mechanisms of enzymes, the function of macromolecular complexes such as the ribosome, and the principles of biocatalysis, reaction kinetics, and thermodynamics of biochemical processes. They analyse chemical model systems of enzymes, plan and carry out the synthesis of oligomers and ligands, apply ligation techniques and array technologies, and integrate these into the solution of scientific questions. They use state-of-the-art equipment appropriately, conduct detailed analysis of experimental data, document results systematically, and reflect critically on methodological aspects within a scientific context.	**Workload:** Attendance time: 196 h Self-study time: 164 h

Course: Enzyme Catalysis and Biological Chemistry (Lecture)	3 WLH
Examination: Written examination (90 minutes) **Examination prerequisites:** regular participation in methods course; certified protocol on methods course (max. 20 pages)	12 C

Course: Tutorial on Enzyme Catalysis and Biological Chemistry (Tutorial)	1 WLH

Course: Methods Course Enzyme Catalysis and Biological Chemistry (Practical course) *Contents*: • Recombinant expression of enzymes and purification using chromatographic methods (affinity, gel filtration and ion exchange chromatography) • Kinetic characterisation of enzymatic reactions using steady-state assays and transient kinetic methods (stopped-flow, quench-flow) • Thermodynamic characterisation of enzyme-inhibitor & enzyme-substrate interactions using spectroscopic methods (circular dichroism, fluorescence spectroscopy, UV-Vis spectroscopy, NMR spectroscopy) and microcalorimetric methods (ITC) • Chemical synthesis of bio-oligomers • Ligation techniques • Organic synthesis and synthesis of (metal) complexes • Application of spectroscopic methods for characterising the electronic structure and reactivity of metal-containing cofactors and synthetic model systems	10 WLH

Examination requirements: Students demonstrate their knowledge through a written examination assessing theoretical foundations, reaction mechanisms, and methodological concepts. They submit a structured laboratory report that documents experimental procedures, data analysis, interpretation of results, and reflection on methodological decisions. Assessment evaluates factual accuracy, critical analysis, quality of documentation, and the ability to present scientific findings clearly and rigorously.	

Admission requirements: cannot be combined with M.Bio.158 or M.Bio.168	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Kai Tittmann
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** 2
Maximum number of students: 20	

Georg-August-Universität Göttingen **Module M.Bio.111: Research Project in General and Applied Microbiology**	12 C 20 WLH

Learning outcome, core skills: Students are able to independently plan, conduct, and document microbiological and molecular biological laboratory techniques, systematically evaluate experimental results, and interpret them in a scientific context. They present their findings in a structured, scientifically sound format and reflect critically on methodological choices, technical challenges, and the biological implications of their results. They demonstrate subject-specific competence, scientific rigor, and the ability to independently solve problems within a research-oriented setting.	**Workload:** Attendance time: 280 h Self-study time: 80 h

Course: Laboratory Practical 7 weeks, time and date upon individual agreement	20 WLH
Examination: Oral examination (approx. 30 minutes) **Examination prerequisites:** certified report in the form of a scientific publication (paper, max. 10 pages) or a certified poster on results of methods course or a scientific presentation (ca. 20 min)	12 C

Examination requirements: Students present their work in either a publication-style manuscript or a scientific presentation that details their experimental procedures, results, and interpretation. The oral examination allows for in-depth discussion and defense of the work, during which students explain their methodology, discuss findings, and critically reflect on their research in front of academic peers. Assessment evaluates scientific depth, quality of the submitted work, structure, argumentative strength, and communication skills during the oral presentation.	

Admission requirements: M.Bio.101	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Jörg Stülke
Course frequency: each semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 6	

Georg-August-Universität Göttingen **Module M.Bio.112: Research Project in Molecular Genetics and Microbial Cell Biology**	12 C 20 WLH

Learning outcome, core skills: Students are able to independently plan, conduct, and document microbiological and molecular biological laboratory techniques, systematically evaluate experimental results, and interpret them in a scientific context. They present their findings in a structured written format and reflect critically on methodological choices, technical challenges, and the biological implications of their results. They demonstrate subject-specific competence, scientific rigor, and the ability to independently solve problems within a research-oriented setting.	**Workload:** Attendance time: 280 h Self-study time: 80 h

Course: Laboratory Practical 7 weeks, time and date upon individual agreement	20 WLH
Examination: Oral examination (approx. 30 minutes) **Examination prerequisites:** certified protocol in the form of a scientific publication (paper, max. 10 pages) or certified poster on results	12 C

Examination requirements: The assessment consists of a written component - either a laboratory report or a scientific poster - documenting the experimental work, and an oral examination in which students defend their methodology, results, and interpretations. The oral exam evaluates subject-matter expertise, critical reflection, argumentative ability, and the capacity for scientific discussion. The report or poster is assessed for accuracy, clarity of structure, methodological transparency, and scientific quality.	

Admission requirements: M.Bio.102	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Stefanie Pöggeler
Course frequency: each semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 6	

Georg-August-Universität Göttingen **Module M.Bio.114: Research Project in Molecular Cell Biology of Plant-Microbe Interactions and Stress Adaptation**	12 C 20 WLH

Learning outcome, core skills: Upon completion of the module, students are capable of independently working on a research project and applying specific working techniques from the field of molecular cell biology of plant-microbe interactions and stress adaptation. They will be able to evaluate and present their experimental results.	**Workload:** Attendance time: 280 h Self-study time: 80 h

Course: Laboratory Practical 7 weeks, time and date upon individual agreement	20 WLH
Examination: Oral examination (approx. 30 minutes) **Examination prerequisites:** certified protocol in form of a scientific publication (paper, 10 pages max) or poster (if a protocol in form of scientific publication has already been examined in another advanced module)	12 C

Examination requirements: The examination tests in-depth knowledge in a selected research area, including the molecular biological, genetic, biochemical, and cell biological manipulation and investigation techniques used therein.	

Admission requirements: M.Bio.104	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Volker Lipka
Course frequency: each semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 6	

Georg-August-Universität Göttingen **Module M.Bio.116: Research Project in Structural Biochemistry**	12 C 20 WLH

Learning outcome, core skills: Students are able to independently carry out biochemical, structural biology and molecular biology working methods, systematically document their experiments, critically evaluate the results and present them in writing in scientific form. They acquire in-depth knowledge of current issues in biochemistry, apply modern analytical and chromatographic techniques as well as structural biology methods, and integrate these into the investigation of scientific questions. They use state-of-the-art equipment professionally, analyse experimental data in detail, and reflect on methodological aspects. In addition, they independently develop specialist knowledge from scientific publications, critically evaluate research literature and integrate their findings into the planning and interpretation of their own experiments. They acquire in-depth knowledge of the department's specific research areas and actively contribute to their scientific context.	**Workload:** Attendance time: 280 h Self-study time: 80 h

Course: Laboratory Practical 7 weeks, time and date upon individual agreement	20 WLH
Examination: Oral examination (approx. 30 minutes) **Examination prerequisites:** certified protocol in the form of a scientific publication (paper, max. 15 pages)	12 C

Examination requirements: Students present and reflect on their experimental work, demonstrate their independent application of biochemical, structural biology and molecular biology methods, and critically evaluate data. They explain the use of modern equipment, the integration of scientific literature and their understanding of the department's main areas of focus. The oral examination tests specialist knowledge, methodological competence and scientific reasoning skills.	

Admission requirements: M.Bio.106	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Ralf Ficner
Course frequency: each semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 6	

Georg-August-Universität Göttingen **Module M.Bio.117: Research Project in Biochemistry and Biophysics**	12 C 20 WLH

Learning outcome, core skills: Students are able to independently apply biochemical, biophysical, and molecular biological techniques, systematically document, evaluate, and present experimental results in a scientific written format. They acquire in-depth knowledge of current topics in biochemistry and biophysics, use state-of-the-art equipment appropriately, and critically analyse experiments. Furthermore, they are able to independently study and reflect on scientific publications and present their findings in a structured, publication-style report.	**Workload:** Attendance time: 280 h Self-study time: 80 h

Course: Laboratory Practical (Practical course) 7 weeks, time and date upon individual agreement	20 WLH
Examination: Oral examination (approx. 30 minutes) **Examination prerequisites:** certified protocol in the form of a scientific publication (paper, max. 15 pages)	12 C

Examination requirements: The assessment is conducted orally and evaluates advanced knowledge of analytical and biophysical methods, as well as their application in current research contexts within the department.	

Admission requirements: M.Bio.107	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Ivo Feußner Prof. Dr. Claudia Steinem
Course frequency: each semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 6	

Georg-August-Universität Göttingen **Module M.Bio.118: Research Project in Enzyme Catalysis and Biological Chemistry**	12 C 20 WLH

Learning outcome, core skills: Students are able to independently apply molecular biological, enzymatic, spectroscopic, thermodynamic, and synthetic analytical methods, and carry out experimental procedures with technical precision. They document their experiments systematically, conduct detailed data analysis, and present their results in a scientifically sound format. They use state-of-the-art equipment appropriately, acquire current specialist knowledge from scientific publications, and integrate it into the analysis of research questions. They apply in-depth knowledge of chromatographic, kinetic, thermodynamic, spectroscopic, and synthetic methods to address scientific problems and reflect on their application within the context of the department's specific research areas.	**Workload:** Attendance time: 280 h Self-study time: 80 h

Course: Laboratory Practical 7 weeks, time and date upon individual agreement	20 WLH
Examination: Oral examination (approx. 30 minutes) **Examination prerequisites:** certified protocol in the form of a scientific publication (paper, max. 10 pages)	12 C

Examination requirements: Students present and defend their experimental work in an oral examination, explaining their methodological choices, results, and interpretations. Assessment evaluates subject-matter expertise, critical reflection, argumentative ability, and the capacity for scientific discussion. The examination also assesses independence, methodological competence, and the integration of current research into the work.	

Admission requirements: M.Bio.108	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Kai Tittmann
Course frequency: each semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 6	

Georg-August-Universität Göttingen **Module M.Bio.121: Research Project II in General and Applied Microbiology**	12 C 20 WLH

Learning outcome, core skills: Students are able to independently plan, conduct, and document microbiological and molecular biological laboratory techniques, systematically evaluate experimental results, and interpret them in a scientific context. They present their findings in a structured, scientifically sound format and reflect critically on methodological choices, technical challenges, and the biological implications of their results. They demonstrate subject-specific competence, scientific rigor, and the ability to independently solve problems within a research-oriented setting.	**Workload:** Attendance time: 280 h Self-study time: 80 h

Course: Laboratory Practical 7 weeks, time and date upon individual agreement	20 WLH
Examination: Oral examination (approx. 30 minutes) **Examination prerequisites:** certified report in the form of a scientific publication (paper, max. 10 pages) or a certified poster on results of methods course or a scientific presentation (ca. 20 min)	12 C

Examination requirements: Students present their work in either a publication-style manuscript or a scientific poster or a scientific presentation that details their experimental procedures, results, and interpretation. The oral examination allows for in-depth discussion and defense of the work, during which students explain their methodology, discuss findings, and critically reflect on their research in front of academic peers. Assessment evaluates scientific depth, quality of the submitted work, structure, argumentative strength, and communication skills during the oral presentation.	

Admission requirements: M.Bio.101, M.Bio.111	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Jörg Stülke
Course frequency: each semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 2	

Georg-August-Universität Göttingen **Module M.Bio.122: Research Project II in Molecular Genetics and Microbial Cell Biology**	12 C 20 WLH

Learning outcome, core skills: Students are able to independently plan, conduct, and document microbiological and molecular biological laboratory techniques, systematically evaluate experimental results, and interpret them in a scientific context. They present their findings in a structured written format and reflect critically on methodological choices, technical challenges, and the biological implications of their results. They demonstrate subject-specific competence, scientific rigor, and the ability to independently solve problems within a research-oriented setting.	**Workload:** Attendance time: 280 h Self-study time: 80 h

Course: Laboratory Practical 7 weeks, time and date upon individual agreement	20 WLH
Examination: Oral examination (approx. 30 minutes) **Examination prerequisites:** certified protocol in the form of a scientific publication (paper, max. 10 pages) or certified poster on results	12 C

Examination requirements: The assessment consists of a written component - either a laboratory report or a scientific poster - documenting the experimental work, and an oral examination in which students defend their methodology, results, and interpretations. The oral exam evaluates subject-matter expertise, critical reflection, argumentative ability, and the capacity for scientific discussion. The report or poster is assessed for accuracy, clarity of structure, methodological transparency, and scientific quality.	

Admission requirements: M.Bio.102	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Stefanie Pöggeler
Course frequency: each semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 2	

Georg-August-Universität Göttingen **Module M.Bio.124: Research Project II in Molecular Cell Biology of Plant-Microbe Interactions and Stress Adaptation**	12 C 20 WLH

Learning outcome, core skills: Upon completion of the module, students are capable of independently working on a research project and applying specific working techniques from the field of molecular cell biology of plant-microbe interactions and stress adaptation. They will be able to evaluate and present their experimental results.	**Workload:** Attendance time: 280 h Self-study time: 80 h

Course: Laboratory Practical 7 weeks, time and date upon individual agreement	20 WLH
Examination: Oral examination (approx. 30 minutes) **Examination prerequisites:** certified protocol in the form of a scientific publication (paper, max. 10 pages) or poster (if a protocol in form of scientific publication has already been examined in another advanced module)	12 C

Examination requirements: The examination tests in-depth knowledge in a selected research area, including the molecular biological, genetic, biochemical, and cell biological manipulation and investigation techniques used therein.	

Admission requirements: M.Bio.104, M.Bio.114	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Volker Lipka
Course frequency: each semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 2	

Georg-August-Universität Göttingen **Module M.Bio.126: Research Project II in Structural Biochemistry**	12 C 20 WLH

Learning outcome, core skills: Students are able to independently carry out biochemical, structural biology and molecular biology working methods, systematically document their experiments, critically evaluate the results and present them in writing in scientific form. They acquire in-depth knowledge of current issues in biochemistry, apply modern analytical and chromatographic techniques as well as structural biology methods, and integrate these into the investigation of scientific questions. They use state-of-the-art equipment professionally, analyse experimental data in detail, and reflect on methodological aspects. In addition, they independently develop specialist knowledge from scientific publications, critically evaluate research literature and integrate their findings into the planning and interpretation of their own experiments. They acquire in-depth knowledge of the department's specific research areas and actively contribute to their scientific context.	**Workload:** Attendance time: 280 h Self-study time: 80 h

Course: Laboratory Practical 7 weeks, time and date upon individual agreement	20 WLH
Examination: Oral examination (approx. 30 minutes) **Examination prerequisites:** certified protocol in the form of a scientific publication (paper, max. 15 pages)	12 C

Examination requirements: Students present and reflect on their experimental work, demonstrate their independent application of biochemical, structural biology and molecular biology methods, and critically evaluate data. They explain the use of modern equipment, the integration of scientific literature and their understanding of the department's main areas of focus. The oral examination tests specialist knowledge, methodological competence and scientific reasoning skills.	

Admission requirements: M.Bio.106, M.Bio.116	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Ralf Ficner
Course frequency: each semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 2	

Georg-August-Universität Göttingen **Module M.Bio.127: Research Project II in Biochemistry and Biophysics**	12 C 20 WLH

Learning outcome, core skills: Students are able to independently apply biochemical, biophysical, and molecular biological techniques, systematically document, evaluate, and present experimental results in a scientific written format. They acquire in-depth knowledge of current topics in biochemistry and biophysics, use state-of-the-art equipment appropriately, and critically analyse experiments. Furthermore, they are able to independently study and reflect on scientific publications and present their findings in a structured, publication-style report.	**Workload:** Attendance time: 280 h Self-study time: 80 h

Course: Laboratory Practical 7 weeks, time and date upon individual agreement	20 WLH
Examination: Oral examination (approx. 30 minutes) **Examination prerequisites:** certified protocol in the form of a scientific publication (paper, max. 15 pages)	12 C

Examination requirements: The assessment is conducted orally and evaluates advanced knowledge of analytical and biophysical methods, as well as their application in current research contexts within the department.	

Admission requirements: M.Bio.107, M.Bio.117	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Ivo Feußner Prof. Dr. Claudia Steinem
Course frequency: each semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 2	

Georg-August-Universität Göttingen **Module M.Bio.128: Research Project II in Enzyme Catalysis and Biological Chemistry**	12 C 20 WLH

Learning outcome, core skills: Students are able to independently apply molecular biological, enzymatic, spectroscopic, thermodynamic, and synthetic analytical methods, and carry out experimental procedures with technical precision. They document their experiments systematically, conduct detailed data analysis, and present their results in a scientifically sound format. They use state-of-the-art equipment appropriately, acquire current specialist knowledge from scientific publications, and integrate it into the analysis of research questions. They apply in-depth knowledge of chromatographic, kinetic, thermodynamic, spectroscopic, and synthetic methods to address scientific problems and reflect on their application within the context of the department's specific research areas.	**Workload:** Attendance time: 280 h Self-study time: 80 h

Course: Laboratory Practical 7 weeks, time and date upon individual agreement	20 WLH
Examination: Oral examination (approx. 30 minutes) **Examination prerequisites:** certified protocol in the form of a scientific publication (paper, max. 10 pages)	12 C

Examination requirements: Students present and defend their experimental work in an oral examination, explaining their methodological choices, results, and interpretations. Assessment evaluates subject-matter expertise, critical reflection, argumentative ability, and the capacity for scientific discussion. The examination also assesses independence, methodological competence, and the integration of current research into the work.	

Admission requirements: M.Bio.108, M.Bio.118	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Kai Tittmann
Course frequency: each semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 2	

Georg-August-Universität Göttingen **Module M.Bio.131: Scientific Project Management**	6 C 5 WLH

Learning outcome, core skills: After attending at least 14 research colloquia or symposia on the Göttingen Campus, students are able to independently summarise current issues in the respective fields, critically evaluate them and articulate their relevance to their own research interests. They can develop a complete research proposal for their planned Master's thesis according to good scientific practice: formulating clear research hypotheses, designing appropriate sampling and study plans, selecting suitable analytical methods, outlining expected results and producing a realistic timetable and resource plan. They are capable of presenting the research proposal convincingly, employing scientific argumentation structures, answering questions competently and defending the project before an expert audience. They master the written presentation of scientific content (research application, literature review, methodology) according to the standards of scholarly journals and funding bodies and can reflect on the principles of project and grant management.	**Workload:** Attendance time: 70 h Self-study time: 110 h

Course: Good Scientific Practice (e-learning course) ()	1 WLH

Course: Center or Institute Colloquia Colloquia given by invited guest speakers as part of the colloquia, seminar series and symposia held at the Göttingen Campus are recognised.	1 WLH

Course: Preparation of a research proposal for the Master's thesis	3 WLH
Examination: Oral Presentation (approx. 20 minutes) **Examination prerequisites:** Proof of attendance of at least 14 scientific colloquia, as well as proof of successful completion of the e-learning course "Good Scientific Practice". Certified research proposal (max. 20 pages) for the Master's thesis.	6 C

Examination requirements: Students present and defend their research proposal orally. They submit a written research proposal that comprehensively documents the scientific question, methodology, planning, and expected outcomes of their master's thesis. Assessment evaluates the scientific quality, methodological plausibility, structure of the proposal, and the clarity and effectiveness of the oral presentation.	

Admission requirements: Two advanced modules; colloquia can be attended from the first semester onwards without any entry requirements.	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Alle
Course frequency:	**Duration:**

each semester	1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 48	

Additional notes and regulations:
Module is usually supervised and examined by the first supervisor of the Master’s thesis.

Georg-August-Universität Göttingen **Module M.Bio.141: General and Applied Microbiology**	3 C 3 WLH

Learning outcome, core skills: Students are able to analyse evolutionary processes and phylogenetic systems of bacteria and archaea, and describe and interpret their morphological and cellular characteristics. They analyse microbial communities and biocoenoses, as well as molecular regulatory mechanisms such as transcription, translation, post-translational control, signal transduction, and genetic networks. They explain the principles of microbial development, the mechanisms of pathogenicity in key pathogens, and the development of novel antimicrobial agents. Furthermore, they can explain the metabolic diversity of bacteria and archaea and its relevance for biotechnological applications and industrial microbiology.	**Workload:** Attendance time: 42 h Self-study time: 48 h

Course: General and Applied Microbiology (Lecture) *Contents*: • Evolution and phylogenetic system • Morphology and cell biology • Communities and biocoenosis of bacteria and archaea • Gene expression and molecular control (transcription, translation) • Posttranslational control, protein stability and proteomics • Genetic networks • Molecular switches and signal transduction • Microbial developmental biology • Mechanisms of pathogenicity of important pathogens • Development of new antimicrobial agents • Diversity of the metabolism in bacteria and archaea as basis for biotechnological applications • Industrial microbiology	3 WLH
Examination: Written examination (90 minutes)	3 C

Examination requirements: Students demonstrate their knowledge through a written examination covering core topics in evolution, cell biology, molecular biology, and microbiology. The exam assesses theoretical understanding, the ability to analyse and integrate biological processes, and the application of concepts in the context of biotechnology, medicine, and ecology. It evaluates factual accuracy, logical argumentation, and critical reflection on interrelationships within the subject area.	

Admission requirements: cannot be combined with M.Bio.101	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Jörg Stülke
Course frequency: each winter semester	**Duration:** 1 semester[s]

Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 10	

Georg-August-Universität Göttingen **Module M.Bio.142: Molecular Genetics and Microbial Cell Biology**	3 C 3 WLH

Learning outcome, core skills: Students are able to analyse molecular biological and cellular processes in model systems of molecular mycology (yeasts and filamentous fungi) using case studies and explain underlying genetic mechanisms. They independently research a scientific topic to the level of a literature review, synthesise current research literature, in a structured critical manner. They also reflect on the biological and methodological implications within the context of contemporary research.	**Workload:** Attendance time: 42 h Self-study time: 48 h

Course: Molecular Genetics and Microbial Cell Biology (Lecture)	3 WLH
Examination: Written examination (90 minutes)	3 C

Examination requirements: The assessment consists of a written examination that evaluates students' understanding of molecular genetics and cell biology in microbial model organisms, as well as their ability to critically analyse and synthesise scientific content. The exam includes tasks on case study analysis, explanation of genetic mechanisms, and evaluation of current research findings. Performance is assessed based on factual accuracy, argumentative strength, and depth of content.	

Admission requirements: cannot be combined with M.Bio.102 or M.Bio.172	**Recommended previous knowledge:** • Watson, Molecular Biology of the Gene, Pearson, 7th Edition; • Alberts, Molecular Biology of the Cell, Wiley, 7th Edition
Language: English	**Person responsible for module:** Prof. Dr. Stefanie Pöggeler
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 10	

Georg-August-Universität Göttingen **Module M.Bio.144: Molecular Cell Biology of Plant-Microbe Interactions and Stress Adaptation**	3 C 3 WLH

Learning outcome, core skills: Upon completion of the module, students will be familiar with fundamental concepts of plant-microbe interactions at the cellular and molecular level and with plant adaptation mechanisms to abiotic stress factors. They will understand the results of current and relevant publications and will be able to critically evaluate them.	**Workload:** Attendance time: 42 h Self-study time: 48 h

Course: Plant-Microbe Interactions (Lecture) *Contents*: • Plant-microbe interactions: models, defense mechanisms, PAMP- and effector-induced immunity • Resistance to biotrophic and necrotrophic pathogens • Hormone-dependent signaling pathways, systemically acquired resistance • Plant responses to abiotic stress (drought, heat) • Gene regulatory networks, stress memory	3 WLH
Examination: Written examination (54 minutes)	3 C

Examination requirements: The exam tests the extent to which students understand the basic concepts and analytical methods of plant-microbe interactions and plant adaptation mechanisms to abiotic stress factors and can summarize them concisely.	

Admission requirements: cannot be combined with M.Bio.104	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Volker Lipka
Course frequency: each summer semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 10	

Georg-August-Universität Göttingen **Module M.Bio.146: Applied Methods of Biosciences**	3 C 5 WLH

Learning outcome, core skills: Students can select and apply appropriate analytical methods from the fields of molecular biology, biochemistry and molecular life sciences – such as DNA analysis, genomics, proteomics, natural product analysis and imaging techniques – to address specific scientific questions. They carry out the methods independently, operate modern equipment professionally and systematically document their experimental procedures and results. In addition, they reflect on the methodological principles, limitations and applications of the techniques used in a scientific context.	**Workload:** Attendance time: 70 h Self-study time: 20 h

Course: Applied Methods of Biosciences (Practical course) methods course from the faculty's range of options	5 WLH
Examination: Minutes / Lab report (max. 20 pages), not graded **Examination requirements:** Students prepare a scientific report in which they describe in detail the chosen method, the experimental procedure, the data analysis and the interpretation of the results. The examination assesses the technical accuracy, methodological independence, quality of data interpretation and structured and scientific presentation in the report. In addition, the ability to critically reflect on the chosen method and its application is examined.	3 C

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** PD Dr. Michael Hoppert
Course frequency: winter and summer semester, on demand	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**

Georg-August-Universität Göttingen **Module M.Bio.149: Planning and Organisation of Industry Excursions**	3 C 2 WLH

Learning outcome, core skills:	**Workload:**
Students plan and organise visits to companies that employ microbiologists or biochemists, taking into account career prospects in the discipline. Together with their supervisor, they select suitable companies, consider their relevance for academic and professional development, draw up a structured visit plan, organise appointments and prepare the content for a specialist symposium. In addition, they reflect on the professional fields of application and career paths in the field of microbiology and biochemistry in the context of their own study and career planning.	Attendance time: 28 h Self-study time: 62 h

Course: Preparation of a 3 day excursion (during lecture free time after winter semester) preliminary meeting during first lecture of M.Bio.102	2 WLH
Examination: Minutes / Lab report, not graded **Examination prerequisites:** Certified schedule of the excursion **Examination requirements:** Students present the selected companies, justify their technical and professional relevance, and present the organisational process of the tour or symposium. They reflect on career prospects in microbiology and biochemistry in the context of their own study and career planning. The examination assesses, in particular, the technical basis for the selection, the quality of planning, and reflection on career development paths.	3 C

Admission requirements: Participation in M.Bio.102	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Kai Heimel
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 8	

Georg-August-Universität Göttingen **Module M.Bio.150: Industry Excursions**	3 C 5 WLH

Learning outcome, core skills: Students can recognise and reflect on the working environment and hiring requirements in industrial facilities in the field of molecular life sciences and/or pharmaceutical companies. They document their findings from the company visits by summarising technical processes, professional activities and organisational structures. They also reflect on the relevance of the industrial field of work for their own technical and professional development.	**Workload:** Attendance time: 70 h Self-study time: 20 h

Course: Industry Excursions 3 day excursion (during lecture free time after winter semester), preliminary meeting during first lecture of M.Bio.102	5 WLH
Examination: Minutes / Lab report (max. 20 pages), not graded **Examination prerequisites:** Participation in preliminary meetings, preparatory seminar and excursions **Examination requirements:** The students jointly compile a scientifically sound report on their visit to the company, covering technical content, work processes and career prospects in the respective working field. The examination assesses the technical accuracy, the structure of the report and the reflection on the professional relevance of the visit. The group work is assessed on the basis of individual contributions and the technical independence of the participants.	3 C

Admission requirements: participation in M.Bio.102	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Kai Heimel
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 30	

Georg-August-Universität Göttingen **Module M.Bio.151: Methods Course: Isolation and Characterisation of Biotechnologically Relevant Microorganisms**	6 C 10 WLH

Learning outcome, core skills: Students can independently and professionally apply molecular biological, genetic and biochemical manipulation and investigation techniques – such as transformation, DNA isolation, PCR, cloning, protein purification, fluorescence microscopy and enzyme tests – using model organisms from the research groups. They plan and carry out experimental work, interpret the results in the context of the respective research question and document their work in a scientific protocol. In addition, they reflect on the possible applications and methodological limitations of the methods used in current research.	**Workload:** Attendance time: 140 h Self-study time: 40 h

Course: Methods Course Isolation and Characterisation of Biotechnologically Relevant Microorganisms (Practical course)	10 WLH
Examination: Minutes / Lab report (max. 10 pages), not graded **Examination prerequisites:** regular participation in methods ccourse	6 C

Examination requirements: Students produce a structured, scientific report covering the experimental planning, implementation, data analysis and interpretation of the methods used. The examination assesses the technical accuracy, independence in using the techniques, quality of data interpretation and scientific presentation in the report. It also tests the ability to critically reflect on the methods chosen and their application in research practice.	

Admission requirements: Can only be taken in combination with M.Bio.101, in which case the methods course „Signal Transduction in Bacteria“ must be selected.	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Jörg Stülke
Course frequency: each winter semester	**Duration:**
Number of repeat examinations permitted: twice	**Recommended semester:**

Georg-August-Universität Göttingen **Module M.Bio.155: Research Project in Applied Bioinformatics in Molecular Biosciences**	12 C 20 WLH

Learning outcome, core skills: Students are able to independently carry out special bioinformatic and statistical analysis procedures, systematically document their experiments, critically evaluate the results and present them in writing in scientific form. They acquire in-depth knowledge of bioinformatic analysis methods for the initial characterisation, evaluation and visualisation of OMICS data, and integrate these into the investigation of scientific questions. They use state-of-the-art equipment professionally, analyse experimental data in detail, and reflect on methodological aspects. In addition, they independently develop specialist knowledge from scientific publications, critically evaluate research literature and integrate their findings into the planning and interpretation of their own experiments. They acquire in-depth knowledge of the department's specific research areas and actively contribute to their scientific context.	**Workload:** Attendance time: 280 h Self-study time: 80 h

Course: Laboratory Practical 7 weeks, time and date upon individual agreement	20 WLH
Examination: Oral examination (approx. 30 minutes) **Examination prerequisites:** certified protocol in form of a scientific publication (paper, max. 10 pages)	12 C

Examination requirements: Students present and reflect on their independently conducted bioinformatic and statistical analyses of OMICS data, demonstrate in-depth knowledge of data analysis and visualisation methods, and show their ability to critically evaluate research literature and incorporate it into their work. They demonstrate a deep understanding of the department's specific research focus areas and argue in a scientifically sound and structured manner.	

Admission requirements: M.Bio.105	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Rolf Daniel
Course frequency: each semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 5	

Georg-August-Universität Göttingen **Module M.Bio.156: Structural Biochemistry**	3 C 3 WLH

Learning outcome, core skills: Students are able to analyse the structure and function of biological macromolecules, particularly proteins, and explain the relationships between structure, folding, and function. They describe structure-function relationships in protein-protein and protein-nucleic acid interactions, apply principles of molecular recognition, and explain approaches to structure-based drug design.	**Workload:** Attendance time: 42 h Self-study time: 48 h

Course: Structural Biochemistry (Lecture)	3 WLH
Examination: Written examination (90 minutes)	3 C

Examination requirements: The written examination tests the students' knowledge of structure-function relationships, protein interactions and structure-based drug design.	

Admission requirements: cannot be combined with M.Bio.106 or M.Bio.176	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Ralf Ficner
Course frequency: each summer semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 10	

Georg-August-Universität Göttingen **Module M.Bio.157: Biochemistry and Biophysics**	3 C 3 WLH

Learning outcome, core skills: Students are able to describe the structure, function, and biophysics of selected biomolecule classes and explain the role of lipids as signalling molecules, as well as the significance of secondary metabolites in plant metabolism. They analyse primary and secondary metabolism, identify functions and regulation of enzymes in lipid metabolism, and evaluate biotechnological approaches for modifying storage compounds.	**Workload:** Attendance time: 42 h Self-study time: 48 h

Course: Biochemistry and Biophysics (Lecture)	3 WLH
Examination: Written examination (90 minutes)	3 C

Examination requirements: Students describe the structure and function of biomolecules, analyse metabolic pathways and the role of lipids and secondary metabolites, identify enzyme functions in lipid metabolism, and evaluate biotechnological approaches. The examination is written and tests understanding, analysis, and critically evaluation using case studies and data.	

Admission requirements: cannot be combined with M.Bio.107	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Ivo Feußner
Course frequency: each summer semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** 2
Maximum number of students: 10	

Georg-August-Universität Göttingen **Module M.Bio.158: Enzyme Catalysis and Biological Chemistry**	3 C 3 WLH

Learning outcome, core skills: Students are able to explain and apply catalytic mechanisms of enzymes, the function of macromolecular complexes such as the ribosome, and the principles of biocatalysis, reaction kinetics, and thermodynamics of biochemical processes. They analyse chemical model systems of enzymes, describe strategies for bio-oligomer and ligand synthesis, and apply ligation techniques and array technologies in research contexts. They acquire in-depth knowledge of current topics in enzymology and bio-(organ)chemistry and are able to reflect on and integrate these into a scientific context.	**Workload:** Attendance time: 42 h Self-study time: 48 h

Course: Enzyme Catalysis and Biological Chemistry (Lecture)	3 WLH
Examination: Written examination (90 minutes)	3 C

Examination requirements: Students demonstrate their knowledge and application skills through a written examination that assesses theoretical foundations, reaction mechanisms, methodological approaches, and current research trends. The exam evaluates the ability to analyse complex biochemical processes, critically assess scientific concepts, and integrate recent research findings into scientific discourse. It is designed to assess factual accuracy, logical reasoning, and depth of scientific reflection.	

Admission requirements: cannot be combined with M.Bio.108	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Kai Tittmann
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 10	

Georg-August-Universität Göttingen **Module M.Bio.161: Methods Course: Signal Transduction in Bacteria**	6 C 10 WLH

Learning outcome, core skills: Students are able to independently apply molecular biological, genetic, and biochemical manipulation and analysis techniques to model organisms used in the participating research groups, and document their results systematically. They carry out techniques such as transformation, DNA isolation, DNA sequencing, diagnostic and quantitative PCR, fluorescence microscopy, enzyme assays, cloning, and protein purification, and apply structural analysis and classification methods for bacteria. They critically interpret experimental data, reflect on methodological choices, and document their work in a structured, scientifically sound laboratory report.	**Workload:** Attendance time: 140 h Self-study time: 40 h

Course: Methods Course Signal Transduction in Bacteria	10 WLH
Examination: Minutes / Lab report (max. 10 pages), not graded **Examination prerequisites:** regular participation in methods course	6 C

Examination requirements: Students produce a scientific laboratory report that clearly documents experimental procedures, execution, data analysis, and interpretation of results. Assessment evaluates technical accuracy, independence in execution and documentation, quality of data interpretation, and the clarity and scientific rigor of the report. The ability to critically reflect on methodological choices and their application is also assessed.	

Admission requirements: Can only be taken in combination with M.Bio.101, in which case the methods course "Isolation and Characterisation of Biotechnologically Relevant Microorganisms" must be selected.	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Jörg Stülke
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**

Georg-August-Universität Göttingen **Module M.Bio.162: Methods Course: Molecular Genetics and Microbial Cell Biology**	6 C 10 WLH

Learning outcome, core skills: Students are able to independently apply molecular biological, genetic, biochemical, and cell biological methods in research- and project-based contexts, and address scientific questions in small groups. They plan, document, and reflect on their experimental procedures, critically evaluate results, and integrate them into a scientific context. They work collaboratively, take responsibility for their tasks, and actively contribute to solving scientific challenges.	**Workload:** Attendance time: 140 h Self-study time: 40 h

Course: Methods Course Molecular Genetics and Microbial Cell Biology	10 WLH
Examination: Minutes / Lab report (max. 10 pages), not graded **Examination prerequisites:** regular participation in methods course	6 C

Examination requirements: Students produce a scientific laboratory report detailing the experimental design, execution, data analysis, interpretation, and critical reflection on methods and results. Assessment evaluates technical accuracy, independence, quality of documentation, and scientific reasoning in the report. The ability to work collaboratively and reflect methodologically is also considered in the evaluation.	

Admission requirements: cannot be combined with M.Bio.102	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Stefanie Pöggeler
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**

Georg-August-Universität Göttingen **Module M.Bio.166: Methods Course: Structural Biochemistry**	6 C 10 WLH

Learning outcome, core skills: Students are able to apply modern methods of structural biochemistry, use state-of-the-art equipment appropriately, and critically analyse experimental data. They present their findings in a scientific format and independently acquire specialised knowledge from current scientific publications.	**Workload:** Attendance time: 140 h Self-study time: 40 h

Course: Methods Course: Structural Biochemistry (Practical course) *Contents*: Preparation of recombinant proteins using affinity, ion exchange and gel filtration chromatography as well as ultracentrifugation, characterisation of recombinant proteins and macromolecular complexes (gel electrophoresis, spectroscopic methods), biochemical analysis of protein-RNA complexes, crystallisation of proteins. Structural elucidation of biological macromolecules using X-ray crystallography and cryo-electron microscopy. Studies on the dynamics and function of macromolecular machines.	10 WLH
Examination: Minutes / Lab report (max. 10 pages), not graded **Examination prerequisites:** Regular participation in methods course; certified protocol	6 C

Examination requirements: The students prepare a detailed experimental protocol in which they present methodological approaches and results in a scientifically sound manner.	

Admission requirements: M.Bio.107, M.Bio.108, M.Bio.156 or M.Bio.176; cannot be combined with M.Bio.106	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Ralf Ficner
Course frequency: each summer semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 5	

Georg-August-Universität Göttingen **Module M.Bio.167: Methods Course: Biochemistry and Biophysics**	6 C 10 WLH

Learning outcome, core skills: The students analyse primary and secondary metabolism, identify functions and regulation of enzymes in lipid metabolism, and evaluate biotechnological approaches for modifying storage compounds. They apply modern biophysical methods for the analysis of biomolecules, use state-of-the-art equipment appropriately, and document experimental results critically and precisely. Students independently acquire specialised knowledge from scientific publications, critically analyse complex experiments, and present their findings in a scientifically sound manner.	**Workload:** Attendance time: 140 h Self-study time: 40 h

Course: Methods Course: Biochemistry and Biophysics *Contents*: Biochemical analysis of secondary metabolites, lipids, proteins, and nucleic acids using photometric tests, electrophoresis, thin-layer chromatography, and fully automated analytical instruments (HPLC/GC/GCMS). Spectroscopy on biomolecules (fluorescence, FT-IR, CD, UV/Vis), modern microscopic methods (optical microscopy, scanning probe methods), functional analyses of various classes of membrane proteins.	10 WLH
Examination: Minutes / Lab report (max. 20 pages), not graded **Examination prerequisites:** regular participation in methods course and certified protocol	6 C

Examination requirements: The students describe and critically analyse complex experiments in a report and present their findings in a scientifically sound manner.	

Admission requirements: M.Bio.106 or M.Bio.108 or M.Bio.157; cannot be combined with M.Bio.107	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Ivo Feußner
Course frequency: each summer semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 5	

Georg-August-Universität Göttingen **Module M.Bio.168: Methods Course: Enzyme Catalysis and Biological Chemistry**	6 C 10 WLH

Learning outcome, core skills: Students are able to explain and apply catalytic mechanisms of enzymes, the function of macromolecular complexes such as the ribosome, and the principles of biocatalysis, reaction kinetics, and thermodynamics of biochemical processes. They plan and carry out experimental approaches for bio-oligomer and ligand synthesis, apply ligation techniques and array technologies, and integrate these into the solution of scientific questions. They use state-of-the-art equipment appropriately, document experimental procedures systematically, conduct detailed data analysis, and present their results in a structured, scientifically sound format.	**Workload:** Attendance time: 140 h Self-study time: 40 h

Course: Methods Course Enzyme Catalysis and Biological Chemistry (Practical course) *Contents*: • Recombinant expression of enzymes and purification using chromatographic methods (affinity, gel filtration and ion exchange chromatography) • Kinetic characterisation of enzymatic reactions using steady-state assays and transient kinetic methods (stopped-flow, quench-flow) • Thermodynamic characterisation of enzyme-inhibitor or enzyme-substrate interactions using spectroscopic methods (circular dichroism, fluorescence spectroscopy, UV-Vis spectroscopy, NMR spectroscopy) and microcalorimetric methods (ITC) • Chemical synthesis of bio-oligomers and ligands • Synthesis of organic and inorganic (metallo) complexes	10 WLH
Examination: Minutes / Lab report (max. 10 pages), not graded **Examination prerequisites:** regular participation; certified protocols	6 C

Examination requirements: Students produce a scientific laboratory report that details experimental methods, execution, data analysis, interpretation of results, and reflection on methodological choices. Assessment evaluates technical accuracy, independence in execution and documentation, quality of data interpretation, and clarity and scientific rigor of the report. The ability to critically reflect on methodological decisions and their application is also assessed.	

Admission requirements: can only be taken in combination with M.Bio.106 or M.Bio.107; cannot be combined with M.Bio.108	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Kai Tittmann

Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 5	

Georg-August-Universität Göttingen **Module M.Bio.172: Molecular Genetics and Microbial Cell Biology**	6 C 4 WLH

Learning outcome, core skills: Students are able to analyse molecular biological and cellular processes in model systems of molecular mycology (yeasts and filamentous fungi) using case studies and explain the underlying genetic mechanisms. They independently research a specific topic in molecular genetics and microbial cell biology to the level of a scientific review, integrate current research literature, and present their finding in a structured, critical, and scientifically sound manner. They analyse complex topics from multiple perspectives, communicate effectively in collaborative settings, and develop well-reasoned, constructive solutions together.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Molecular Genetics and Microbial Cell Biology (Lecture)	3 WLH

Course: Seminar on Molecular Genetics and Microbial Cell Biology (Seminar)	1 WLH

Examination: Written examination (90 minutes) **Examination prerequisites:** Regular participation in seminar; successful seminar presentation (ca. 15 minutes). The seminar presentation can earn up to 10% of the total points for the exam in advance.	6 C

Examination requirements: Students demonstrate their competences through a written exam covering the lecture content, assessing their theoretical understanding of molecular genetics and cell biology, and a scientific seminar presentation on an independently researched topic. The presentation is assessed for depth of content, scientific structure, critical analysis of literature, and clarity of communication. Both components are evaluated jointly and reflect the student's subject-specific, analytical, and presentation skills.	

Admission requirements: cannot be combined with M.Bio.102 or M.Bio.142	**Recommended previous knowledge:** • Watson, Molecular Biology of the Gene, Pearson, 7th Edition; • Alberts, Molecular Biology of the Cell, Wiley, 7th Edition
Language: English	**Person responsible for module:** Prof. Dr. Stefanie Pöggeler
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 6	

Georg-August-Universität Göttingen **Module M.Bio.176: Structural Biochemistry**	6 C 4 WLH

Learning outcome, core skills: Students are able to analyse the structure and function of biological macromolecules, particularly proteins, and explain the relationships between structure, folding, and function. They describe structure-function relationships in protein-protein and protein-nucleic acid interactions, apply principles of molecular recognition, and explain approaches to structure-based drug design. Students actively contribute to scholarly discussions, and reflect on recent developments in biochemistry. They analyse complex topics from multiple perspectives, apply effective communication strategies to support collaborative work, present well-reasoned arguments, and work jointly to develop informed and constructive solutions.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Structural Biochemistry (Lecture)	3 WLH

Course: Seminar on Structural Biochemistry (Seminar)	1 WLH

Examination: Written examination on content of lecture (90 min) [80% of overall grade]; seminar presentation (ca. 15 min) [20% of overall grade] **Examination prerequisites:** regular participation in seminar	6 C

Examination requirements: In a scientific seminar presentation, students critically analyse current publications in the field of structural biochemistry and molecular recognition. A written examination tests their knowledge of structure-function relationships, protein interactions and structure-based drug design.	

Admission requirements: cannot be combined with M.Bio.106 or M.Bio.156	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Ralf Ficner
Course frequency: each summer semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 5	

Georg-August-Universität Göttingen **Module M.Bio.180: Students Project in Synthetic Biology**	12 C 14 WLH

Learning outcome, core skills: Students are able to understand and apply fundamental concepts of synthetic biology to develop and implement an independent research project. They independently plan and conduct microbiological, biochemical, and genetic methods - including molecular cloning, protein expression and analysis, reporter gene assays, and fluorescence microscopy - to address scientific questions. They document their experimental procedures, analyse results, and present their work in a structured, scientifically sound presentation.	**Workload:** Attendance time: 196 h Self-study time: 164 h

Course: Advances in Synthetic Biology (Seminar)	2 WLH
Course: Students Laboratory Project (Practical course)	12 WLH
Examination: Oral Presentation (approx. 30 minutes), not graded **Examination prerequisites:** Regular attendance and participation in practical work and seminar	12 C

Examination requirements: Students present their independently developed and executed research project in a scientific presentation covering objectives, methodology, results, and interpretation at national and international level. Assessment evaluates scientific depth, methodological independence, clarity of presentation, and the ability to communicate findings and reflect critically on results.	

Admission requirements: At least one core module has to be finished	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Jörg Stülke
Course frequency: each summer semester	**Duration:** 1-2 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 12	

Georg-August-Universität Göttingen **Module M.Bio.340: Systems Biology**	3 C 2 WLH

Learning outcome, core skills: Students are able to formally describe, model, analyse, and simulate complex interactions within living systems across multiple levels of abstraction - from molecules and cells to organs. They identify and interpret biomolecular networks such as metabolic, signal transduction, and gene regulatory networks, and apply graph-based abstraction models (e.g. Entity-Interaction Graphs, Boolean Networks, Petri Nets). They apply fundamental concepts of graph theory - including path analysis, clustering coefficient, and centrality - to biomolecular networks and integrate them into the analysis of biological systems. They explain high-throughput experimental methods and their application in network analysis and can reflect on the results within a scientific context.	**Workload:** Attendance time: 42 h Self-study time: 48 h

Course: Bioinformatics of Systems Biology (Lecture)	2 WLH
Examination: Oral examination (approx. 30 minutes)	3 C

Examination requirements: Students demonstrate their knowledge through an oral examination, in which they explain and critically discuss complex modelling approaches, analytical methods, and applications in network bioinformatics. The exam assesses depth of understanding, the ability to integrate concepts from modelling, graph theory, and experimental data analysis, and scientific reasoning. It evaluates clarity of presentation, logical structure of arguments, and critical reflection on methodological and biological implications.	

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Tim Beißbarth
Course frequency: each summer semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 10	

Georg-August-Universität Göttingen **Module M.Bio.343: Cell Biology**	6 C 3 WLH

Learning outcome, core skills: Students are able to explain and contextualise the molecular organisation of the cell, processes of cell proliferation, differentiation, and cell death, as well as mechanisms of cell communication. They critically analyse scientific data, integrate it into a scientific discourse, and present it in a structured, scientifically sound manner. They conduct targeted literature research, evaluate the quality and relevance of sources, and integrate current research findings into their arguments. They present their insights clearly, precisely, and convincingly - particularly in a scientific seminar presentation - and are able to argue effectively in a discussion.	**Workload:** Attendance time: 42 h Self-study time: 138 h

Course: Molecular Cell Biology (Lecture)	2 WLH
Examination: Written examination (90 minutes) **Examination prerequisites:** Seminar presentation (ca. 15 min)	6 C

Course: Topics in Molecular Cell Biology (Seminar)	1 WLH

Examination requirements: Students demonstrate their knowledge through a written examination assessing theoretical foundations, methodological approaches, and applications in cell biology. They present a scientific topic in the seminar as a presentation, analysing and critically discussing research findings. Assessment evaluates scientific depth, quality of argumentation, clarity of presentation, and communication skills in scientific discussion.	

Admission requirements: cannot be combined with M.Bio.303 or M.Bio.363	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** PD Dr. Gerd Vorbrüggen
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 5	

Georg-August-Universität Göttingen **Module M.Bio.344: Neurobiology 1**	3 C 2 WLH

Learning outcome, core skills: Students are able to explain and apply fundamental methods in molecular, cellular, and systems neuroscience to address scientific questions in neuroscience.They describe core experimental approaches - such as genetic manipulation, electrophysiology, imaging, cell culture, and data analysis - and evaluate their application in research practice. They integrate current research findings into their explanations and are able to clearly and precisely present complex relationships between structure, function, and regulation in the nervous system. They apply scientific concepts, reflect on methodological choices, and can contribute meaningfully to scientific discussions.	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: From Gene to Behaviour (Lecture)	2 WLH
Examination: Written examination (60 minutes)	3 C

Examination requirements: Students demonstrate their knowledge through a written examination assessing theoretical foundations, methodological approaches, and applications in neuroscience. The exam evaluates the ability to analyse complex biological processes, integrate concepts from molecular and cellular biology, and engage in scientific reasoning. It is designed to assess factual accuracy, logical structure of arguments, and depth of scientific reflection.	

Admission requirements: cannot be combined with M.Bio.304	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Martin Göpfert
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 27	

Georg-August-Universität Göttingen **Module M.Bio.347: Behavioral Biology**	6 C 4 WLH

Learning outcome, core skills: Students are able to explain and apply the principles of the evolutionary approach to behavioural analysis to address biological questions in behavioural biology. They present scientific content in a structured, scientific manner - both in writing and orally - and critically discuss results within a scientific discourse. They actively participate in the seminar, deliver a scientific presentation, and contribute meaningfully through critical questions and well-founded input. They independently research current research topics and integrate scientific literature into their arguments.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Behavioural Biology (Lecture)	3 WLH
Examination: Written examination (90 minutes) **Examination prerequisites:** regular and active participation, oral presentation within the seminar (ca. 15 min)	6 C

Course: Seminar on Behavioural Biology (Seminar)	1 WLH

Examination requirements: Students demonstrate their knowledge through a written examination assessing theoretical foundations, methodological approaches, and applications in behavioural biology. Additionally, active seminar participation and the delivery of a scientific presentation are assessed as core components of the assessment. The examination evaluates scientific depth, quality of presentation, clarity of argumentation, and communication skills in scientific discussion.	

Admission requirements: M.Bio.306, M.Bio-NF.306 or M.Bio.346; cannot be combined with M.Bio.307 or M.Bio-NF.307	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Dr. Claudia Fichtel
Course frequency: each summer semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 12	

Georg-August-Universität Göttingen **Module M.Bio.350: From Vision to Action**	3 C 2 WLH

Learning outcome, core skills: Students are able to explain and critically reflect on the current scientific knowledge of the visual system in primates, including humans and non-human primates. They analyse the structure and function of visual and visuo-motor systems at an advanced level and integrate neurobiological, functional, and evolutionary aspects into their explanations. They apply scientific concepts of visual perception, signal processing, and motor integration and can discuss these within the context of current research findings. They present their insights in a structured, scientifically sound manner and are able to clearly and precisely communicate complex relationships.	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: From Vision to Action (Lecture)	2 WLH
Examination: Written examination (75 minutes)	3 C

Examination requirements: Students demonstrate their knowledge through a written examination assessing theoretical foundations, functional mechanisms, and current research findings in the visual and visuo-motor system. The exam evaluates the ability to analyse complex neurobiological processes, integrate concepts from neuroanatomy, physiology, and evolution, and critically reflect on scientific approaches. It is designed to assess factual accuracy, logical reasoning, and depth of scientific reflection.	

Admission requirements: none	**Recommended previous knowledge:** a basic understanding of neurobiology gained through attendance at the lecture "Cognitive Neuroscience" (Biology), "Biopsychology" (Psychology) or a comparable lecture
Language: English	**Person responsible for module:** Prof. Dr. Alexander Gail
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 50	

Georg-August-Universität Göttingen **Module M.Bio.356: Motor Systems**	6 C 4 WLH

Learning outcome, core skills: Students are able to explain and compare the anatomy and physiology of cortical and subcortical structures, the spinal cord, and neuromuscular activation in the motor system of primates, including humans and non-human primates. They analyse mechanisms of motor planning, motor control, and the development of brain-machine interfaces at an advanced level and integrate these into a scientific context. They explain pathological changes in the motor system and their impact on motor function. They apply scientific research approaches, conduct in-depth literature research on current findings, and present their insights in a structured, scientifically sound seminar presentation. They defend their arguments and scientific evaluation in an oral examination.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Motor Systems (Lecture)	2 WLH
Course: Seminar on Motor Systems (Seminar)	2 WLH
Examination: Oral examination (approx. 15 minutes) **Examination prerequisites:** seminar presentation (ca. 30 min)	6 C

Examination requirements: Students demonstrate their competences through scientific seminar presentations on current topics in primate motor systems, including critical discussion of the literature. An oral examination follows, in which they explain and critically discuss the structure and function of the motor system, mechanisms of motor control, and applications such as brain-machine interfaces. Assessment evaluates scientific depth, quality of presentation, clarity of argumentation, and communication skills in the oral discussion.	

Admission requirements: cannot be combined with M.Bio.357	**Recommended previous knowledge:** a basic understanding of neurobiology gained through attendance at the lecture "Cognitive Neuroscience" (Biology), "Biopsychology" (Psychology) or a comparable lecture
Language: English	**Person responsible for module:** Prof. Dr. Hansjörg Scherberger
Course frequency: each summer semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 30	

Georg-August-Universität Göttingen **Module M.Bio.357: Motor Systems**	3 C 2 WLH

Learning outcome, core skills: Students are able to explain and compare the anatomy and physiology of cortical and subcortical structures, the spinal cord, and neuromuscular activation in the motor system of primates, including humans and non-human primates. They analyse mechanisms of motor planning, motor control, and the development of brain-machine interfaces at an advanced level and integrate these into a scientific context. They explain pathological changes in the motor system and their impact on motor function. They apply scientific concepts, integrate current research findings, and are able to clearly and precisely present complex relationships in scientific discourse.	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Motor Systems (Lecture)	2 WLH
Examination: Oral examination (approx. 15 minutes)	3 C

Examination requirements: Students demonstrate their knowledge through an oral examination, in which they explain and critically discuss the structure and function of the motor system, mechanisms of motor control, and applications of brain-machine interfaces. The exam assesses the ability to analyse complex neurobiological processes, integrate concepts from anatomy, physiology, and neurotechnology, and engage in scientific reasoning. It evaluates scientific depth, logical structure of arguments, and clarity of presentation.	

Admission requirements: cannot be combined with M.Bio.356	**Recommended previous knowledge:** a basic understanding of neurobiology gained through attendance at the lecture "Cognitive Neuroscience" (Biology), "Biopsychology" (Psychology) or a comparable lecture
Language: English	**Person responsible for module:** Prof. Dr. Hansjörg Scherberger
Course frequency: each summer semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: not limited	

Georg-August-Universität Göttingen **Module M.Bio.363: Cell Biology**	3 C 2 WLH

Learning outcome, core skills: Students are able to explain and contextualise the molecular organisation of the cell, processes of cell proliferation, differentiation, and cell death, as well as mechanisms of cell communication. They analyse complex cellular processes, integrate current research findings, and are able to clearly and precisely present the relationships between structure, function, and regulation in cells. They apply scientific concepts, reflect on biological mechanisms, and can critically discuss complex relationships in a scientific discourse.	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Molecular Cell Biology (Lecture)	2 WLH
Examination: Written examination (90 minutes)	3 C

Examination requirements: Students demonstrate their knowledge through a written examination assessing theoretical foundations, functional relationships, and applications in cell biology. The exam evaluates the ability to analyse complex biological processes, integrate concepts from cell structure, function, and regulation, and engage in scientific reasoning. It is designed to assess factual accuracy, logical structure of arguments, and depth of scientific reflection.	

Admission requirements: cannot be combined with M.Bio.303 or M.Bio.343	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** PD Dr. Gerd Vorbrüggen
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 10	

Georg-August-Universität Göttingen **Module M.Bio.366: Introduction to Behavioral Biology**	3 C 3 WLH

Learning outcome, core skills: Students are able to explain and contextualise fundamental concepts in behavioural biology - particularly in the fields of behavioural ecology, sociobiology, and cognition - with special attention to the quantitative aspects of behavioural research. They describe core methods in behavioural biology, analyse their application in research practice, and evaluate their advantages and limitations in relation to scientific questions. They present scientific content in a structured, scientifically sound manner - particularly in writing - and are able to clearly and precisely communicate complex relationships. They integrate current research findings into their arguments and can contribute meaningfully to scientific discussions.	**Workload:** Attendance time: 42 h Self-study time: 48 h

Course: Introduction to Behavioral Biology (Lecture)	3 WLH
Examination: Written examination (90 minutes)	3 C

Examination requirements: Students demonstrate their knowledge through a written examination assessing theoretical foundations, methodological approaches, and applications in behavioural biology. The exam evaluates the ability to analyse complex biological processes, integrate concepts from behavioural ecology, sociobiology, and cognition, and engage in scientific reasoning. It is designed to assess factual accuracy, logical structure of arguments, and clarity of presentation.	

Admission requirements: cannot be combined with M.Bio.306 or M.Bio.346	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Dr. Oliver Schülke
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 4	

Georg-August-Universität Göttingen **Module M.Bio.371: Molecular Basis of Neurological Diseases**	2 C 2 WLH

Learning outcome, core skills: Students are able to explain core concepts in molecular and cellular neuroscience using neurological diseases as examples, and place them within biological and clinical contexts. They discuss the genetic, molecular, and cellular bases of diseases, the affected brain structures, animal models, and current therapeutic approaches. They conduct targeted literature research, select relevant information, and prepare it for a scientific presentation. They present their work in a clear, structured, and convincing manner using supportive slides and are able to engage in scientific discussion, answer questions, and reflect critically.	**Workload:** Attendance time: 14 h Self-study time: 46 h

Course: Molecular Basis of Neurological Diseases (Seminar) The students familiarize themselves with a given topic in order to present it in a block seminar. If requested, the students will be coached by a supervisor regarding selection and understanding of literature and preparation of the presentation.	2 WLH
Examination: Oral Presentation (approx. 60 minutes) **Examination prerequisites:** Regular participation in the block seminar	2 C

Examination requirements: Students demonstrate their competences through a scientific seminar presentation on an independently researched topic in the field of molecular basis of neurological diseases, followed by a discussion. Assessment evaluates scientific depth, quality of literature selection, clarity of presentation and slides, structure of argumentation, and communication skills in scientific discourse. The ability to independently process scientific knowledge and critically reflect on published findings is also assessed.	

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Hauke Werner
Course frequency: each summer semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: once	**Recommended semester:**
Maximum number of students: 12	

Additional notes and regulations:
Participants contact the organizer of the module (hauke@mpinat.mpg.de) in a timely manner for matching seminar topic and supervisor.

Georg-August-Universität Göttingen **Module M.Bio.372: Matlab in Biopsychology and Neuroscience**	3 C 2 WLH

Learning outcome, core skills: Students are able to understand and apply fundamental concepts and functions of MATLAB, particularly in the context of psychophysical and neuroscience applications. They can read and interpret existing MATLAB code critically and understand its functionality within a scientific context. They independently develop MATLAB programs to address research questions, implementing algorithms, data processing, visualization, and simulations. They document their programs in a structured manner and apply best practices in programming to produce scientifically sound and reproducible results.	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Matlab in Biopsychology and Neuroscience (Lecture)	1 WLH
Course: Tutorial on Matlab in Biopsychology and Neuroscience (Tutorial)	1 WLH
Examination: Written examination (90 minutes) **Examination prerequisites:** regular participation at tutorials and completion of the exercises	3 C

Examination requirements: Students demonstrate their competences through a written examination assessing theoretical foundations, programming skills, and the application of MATLAB in psychophysics and neuroscience. The exam evaluates the ability to analyse existing code, understand program logic, and develop simple programs for data analysis or simulation. It is designed to assess factual accuracy, logical structure of solutions, and the application of programming principles.	

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Alexander Gail
Course frequency: each summer semester; first half of semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 20	

Additional notes and regulations: The event is suitable for highly motivated Bachelor's and Master's students of Psychology, Biology and Physics who have an above-average interest in research.

Georg-August-Universität Göttingen **Module M.Bio.373: Visual Psychophysics - From Theory to Experiment**	3 C 2 WLH

Learning outcome, core skills: Students are able to explain and apply the fundamentals of psychophysics to investigate human sensorimotor performance. They critically evaluate psychophysical studies, assessing methodological approaches, data quality, and interpretative validity. They independently plan and conduct small-scale psychophysical experiments, applying appropriate measurement techniques, experimental designs, and statistical analyses. They document their work systematically and interpret results within a scientific context. They integrate theoretical knowledge with practical application and are able to clearly and precisely present complex relationships in scientific form.	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Basics of Psychophysics	1 WLH
Course: Methods Course Advanced Psychophysics practical course in computer lab	1 WLH
Examination: Written examination (60 minutes) **Examination prerequisites:** regular participation in methods course	3 C

Examination requirements: Students demonstrate their knowledge through a written examination assessing theoretical foundations, methodological approaches, and applications in psychophysics. The exam evaluates the ability to critically assess studies, apply measurement techniques, and interpret results. It is designed to assess factual accuracy, logical reasoning, and depth of scientific reflection.	

Admission requirements: A prerequisite is prior attendance at the lecture "Biologische Psychologie II"/"Kognitive Neurowissenschaften" or an equivalent course.	**Recommended previous knowledge:** Attendance at the course M.Bio.372 "Matlab in Biopsychology and Neuroscience" during the first half of the summer term is strongly recommended.
Language: English	**Person responsible for module:** Prof. Dr. Stefan Treue
Course frequency: each summer semester; second half of term	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 20	

Additional notes and regulations: The module is suitable for highly motivated Bachelor's and Master's students of Psychology, Biology and Physics who have an above-average interest in research.

Georg-August-Universität Göttingen **Module M.Bio.374: Introduction to Computer Modelling**	2 C 2 WLH

Learning outcome, core skills: Students are able to explain and apply core concepts of computer modelling in evolutionary biology, behavioral ecology, sociobiology, and cognition, particularly in the context of cooperative behavior in humans. They independently design and implement computer models to address self-chosen scientific questions, selecting appropriate algorithms, parameters, and simulation scenarios. They programme models using a suitable programming language, critically analyze the results, and interpret them within a biological and evolutionary context. They document their work in a structured, scientifically sound report and present their findings in a clear, precise, and convincing manner. They code and learn how to use Artificial Intelligence for correcting and completing their code.	**Workload:** Attendance time: 24 h Self-study time: 36 h

Course: Developing and Creating Evolutionary Computer Models (Exercise)	1,5 WLH
Course: Introduction to Computer Modeling and Human Cooperative Behavior (Seminar)	0,5 WLH
Examination: Minutes / Lab report (max. 4 pages), not graded **Examination prerequisites:** Short presentation (ca. 10 min)	2 C

Examination requirements: Students submit a structured laboratory report covering the modeling rationale, programming approach, simulation results, and interpretation. They deliver a scientific short presentation in which they clearly and effectively communicate their modeling method, research question, and findings. The examination assesses the depth of knowledge, the quality of the programming, the clarity of the presentation and the ability to communicate effectively in an academic setting.	

Admission requirements: none	**Recommended previous knowledge:** none
Language: English, German	**Person responsible for module:** Prof. Dr. Dirk Semmann
Course frequency: each winter semester	**Duration:**
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 14	

Georg-August-Universität Göttingen **Module M.Bio.392: Current Developmental Biology**	6 C 4 WLH

Learning outcome, core skills: Students are able to explain and apply the theoretical principles of developmental genetics, developmental biochemistry, and developmental biology, particularly in the context of morphogenetic processes and pattern formation. They analyse methods for determining gene function and embryo manipulation and can critically evaluate their application in research. They can use publicly accessible databases for *in silico* sequence analysis and model system-specific resources. They explain fundamental aspects of the evolution of developmental processes and can place them within a scientific context.They conduct targeted literature research, select relevant information, and prepare it for a scientific presentation. They present their work in a clear, structured, and convincing manner and are able to engage in scientific discussion, answer questions, and reflect critically.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Current Developmental Biology (Lecture)	2 WLH
Examination: Written examination (90 minutes) **Examination prerequisites:** Seminar presentation of a publication (ca. 20 min)	6 C

Course: Exercises and Deepening of Lecture Content (Tutorial)	1 WLH

Course: Current Topics in Developmental Biology (Seminar)	1 WLH

Examination requirements: Students present a current scientific publication in a seminar talk, explaining the research question, methodology, results, and interpretation, followed by a discussion. Assessment evaluates scientific depth, quality of literature selection, clarity of presentation, structure of argumentation, and communication skills in scientific discourse. Students finally demonstrate their knowledge through a written examination assessing theoretical foundations, methodological approaches, and applications in developmental biology.	

Admission requirements: cannot be combined with M.Bio.321 or M.Bio.393	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Ernst Anton Wimmer
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students:	

5	

Georg-August-Universität Göttingen **Module M.Bio.393: Current Developmental Biology**	3 C 3 WLH

Learning outcome, core skills: Students are able to explain and apply the theoretical principles of developmental genetics, developmental biochemistry, and developmental biology, particularly in the context of morphogenetic processes and pattern formation. They analyse methods for determining gene function and embryo manipulation and can critically evaluate their application in research. They explain fundamental aspects of the evolution of developmental processes and can place them within a scientific context. They integrate current research findings into their arguments and are able to clearly and precisely present complex relationships in scientific discourse.	**Workload:** Attendance time: 42 h Self-study time: 48 h

Course: Current Developmental Biology (Lecture)	2 WLH
Course: Exercises and Deepening of Lecture Content (Tutorial)	1 WLH
Examination: Written examination (90 minutes)	3 C

Examination requirements: Students demonstrate their knowledge through a written examination assessing theoretical foundations, methodological approaches, and applications in developmental biology. The exam evaluates the ability to analyse complex biological processes, integrate concepts from genetics, biochemistry, and developmental biology, and engage in scientific reasoning. It is designed to assess factual accuracy, logical structure of arguments, and depth of scientific reflection.	

Admission requirements: cannot be combined with M.Bio.321 or M.Bio.392	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Ernst Anton Wimmer
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 5	

Georg-August-Universität Göttingen **Module M.Bio.394: Frontiers in Neural Development**	6 C 4 WLH

Learning outcome, core skills: Students are able to explain and compare the principles and mechanisms of neural development in insects and vertebrates, including neuroectodermal regionalization, axon guidance, development of neural stem cells and glia. They can explain fundamental aspects of the evolution of neural development. They know the strength and weaknesses of model systems in neurodevelopmental biology and are able to choose model systems according to the scientific question. They independently design experimental approaches to address scientific questions using modern methods. They critically discuss data in a scientific context, and perform scientific presentations.	**Workload:** Attendance time: 50 h Self-study time: 130 h

Course: Development and Evolution of the Nervous System (Lecture)	2 WLH
Examination: Written examination (90 minutes) **Examination prerequisites:** Regular participation in seminar. Seminar presentation and discussion of cutting edge experimental approaches. Design, presentation and discussion of self-developed experimental approaches.	6 C

Course: Exercises and Consolidation of Lecture "Development and Evolution of the Nervous System" (Tutorial)	1 WLH

Course: Seminar on Conception of Experiments with Modern Methods (Seminar)	1 WLH

Examination requirements: Students demonstrate their knowledge through a written examination assessing theoretical foundations, experimental concepts, and biological mechanisms. They present their independently developed experimental approaches in a scientific seminar and defend them in a subsequent oral discussion, explaining their methodology and scientific aims. Assessment evaluates scientific depth, methodological creativity, quality of data analysis, and communication skills in the scientific discussion.	

Admission requirements: cannot be combined with M.Bio.322 or M.Bio.395	**Recommended previous knowledge:** a basic understanding of developmental biology (e.g. module M.Bio.321 or relevant textbook chapters on insect and vertebrate developmental biology)
Language: English	**Person responsible for module:** Prof. Dr. Gregor Bucher
Course frequency: each summer semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted:	**Recommended semester:**

twice	
Maximum number of students: 5	

Georg-August-Universität Göttingen **Module M.Bio.395: Frontiers in Neural Development**	3 C 3 WLH

Learning outcome, core skills: Students are able to explain and compare the principles and mechanisms of neural development in insects and vertebrates, including neuroectodermal regionalization, axon guidance, development of neural stem cells and glia. They can explain fundamental aspects of the evolution of neural development. They know the strength and weaknesses of model systems in neurodevelopmental biology and are able to choose model systems according to the scientific question.	**Workload:** Attendance time: 42 h Self-study time: 48 h

Course: Development and Evolution of the Nervous System (Lecture)	2 WLH
Course: Exercises and Consolidation of Lecture "Development and Evolution of the Nervous System" (Tutorial)	1 WLH
Examination: Written examination (90 minutes)	3 C

Examination requirements: Students demonstrate their knowledge through a written examination assessing theoretical foundations, experimental concepts, and biological mechanisms.	

Admission requirements: cannot be combined with M.Bio.322 or M.Bio.394	**Recommended previous knowledge:** a basic understanding of developmental biology (e.g. module M.Bio.321 or relevant textbook chapters on insect and vertebrate developmental biology)
Language: English	**Person responsible for module:** Prof. Dr. Gregor Bucher
Course frequency: each summer semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 5	

Georg-August-Universität Göttingen **Module M.Che.3902: Internship in Chemistry or Pharmaceutical Industry**	6 C (incl. key comp.: 3 C)

Learning outcome, core skills: Die Studierenden • haben bei einem der Partnerunternehmen der Fakultät oder einem anderen Unternehmen mit chemischem Tätigkeitsfeld Einblicke in aktuelle Forschungs- und Entwicklungsgebiete der chemischen Industrie erhalten. • haben Tätigkeitsfelder für angehende Industriechemiker*innen im realen Arbeitsumfeld kennengelernt, • sind in der Lage, Tätigkeiten und Ergebnisse in einem Erfahrungsbericht zu beschreiben und zu bewerten.	**Workload:** Attendance time: 160 h Self-study time: 20 h

Course: Praktikum in der chemischen Industrie Mindestens 4 Wochen	
Examination: Ergebnisprotokoll und Erfahrungsbericht (max. 15 Seiten), not graded **Examination requirements:** Praktische Tätigkeiten zusammenfassend protokollieren, Ergebnisse und Erfahrungen strukturiert darstellen und im Rahmen der eigenen Ausbildung bewerten. Einblicke in aktuelle Forschungs- und Entwicklungsgebiete der chemischen Industrie; Kenntnis von Tätigkeitsfeldern für angehende Industriechemiker im realen Arbeitsumfeld	6 C

Admission requirements: individuelle Zugangsvoraussetzungen abhängig von den Anforderungen des Unternehmens für den Praktikumsplatz	**Recommended previous knowledge:** none
Language: German, English	**Person responsible for module:** Studiendekan/in
Course frequency: Jedes Semester in Abstimmung mit den Partnerunternehmen der Chemischen Industrie	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:**
Maximum number of students: not limited	

Georg-August-Universität Göttingen **Module M.CoBi.506: Linux and Python for biologists**	5 C 3 WLH

Learning outcome, core skills: After successful completion of the module, students have basic knowledge of the Linux operating system as well as basic programming skills in Python or comparable languages.	**Workload:** Attendance time: 42 h Self-study time: 108 h

Course: Linux and Python for biologists *Contents*: The practical course "Linux and Python for Biologists and Physicians" teaches basic knowledge of the Linux operating system and programming in Python with special emphasis on bioinformatics applications. Linux and Python are necessary basics for all further activities in the field of bioinformatics. The skills taught in the lab are therefore essential for many computer-based activities in science and industry. In this course, the basics of Unix-based operating systems are introduced first. The focus is on the safe operation of the Unix shell and the use of basic Bash commands. In addition, simple concepts of data processing in the shell are introduced and simple Bash scripts are presented. The Python programming language is then comprehensively introduced. This includes 1) the basics of programming and its syntax in Python (data types, control structures, functions, etc.), 2) advanced concepts of programming with a focus on bioinformatics (containers, iterators, external modules, etc.), and 3) processing and visualizing data using Python. Examples from biology will be used to illustrate the concepts and apply them in exercises. No programming knowledge is assumed. The primary goal of this course is for students to feel confident using Linux and Python and to be able to independently process and visualize data from their subject area appropriately.	3 WLH
Examination: Practical examinationwith oral presentation (20min), not graded **Examination prerequisites:** three small project works covering the topics of the respective week	

Examination requirements: Independent work with the command line interpreter under the Linux operating system; creation of small programs in the Python programming language (reading data from files, creating suitable data structures, handling regular expressions, implementation of simple algorithms)	

Admission requirements: none	**Recommended previous knowledge:** B.Bio.113
Language: English, German	**Person responsible for module:** Dr. Sophie de Vries
Course frequency: each winter semester	**Duration:** 1 semester[s]

Number of repeat examinations permitted: twice	**Recommended semester:** 1 - 4
Maximum number of students: 20	

Georg-August-Universität Göttingen **Module SK.Bio.117: Genome analysis**	3 C 2 WLH

Learning outcome, core skills: Die Studierenden lernen grundlegende Methoden der Genomanalyse kennen. Nach erfolgreicher Teilnahme an diesem Modul verfügen sie über Grundkenntnisse in den Bereichen Genomsequenzierung, Funktion und Struktur von Genomen und Algorithmen zur bioinformatischen Genomanalyse.	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Genomanalyse (Lecture) nach Absprache als Online-Veranstaltung oder in Präsenz	2 WLH
Examination: Written examination (90 minutes) **Examination requirements:** Grundlegende Methoden der Genomanalyse, insbesondere Genomassemblierung, Sequenzalignment, und grundlegende Algorithmen zur Rekonstruktion phylogenetischer Bäume auf der Grundlage von Genomsequenzen.	3 C

Admission requirements: none	**Recommended previous knowledge:** grundlegende Programmierkenntnisse wie beispielsweise aus dem LINUX/Python-Kurs (SK.Bio.307) oder anderen Programmierkursen
Language: German	**Person responsible for module:** Prof. Dr. Jan de Vries
Course frequency: each summer semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** 3 - 6

Additional notes and regulations:
Das Modul kann nicht in Kombination mit B.Bio.117 oder B.Bio-NF.117 belegt werden.

Georg-August-Universität Göttingen **Module SK.Bio.307: Linux and Python for biologists**	4 C 3 WLH

Learning outcome, core skills: After successfully completing the module, students have basic knowledge of the Linux operating system and basic programming skills in Python or comparable languages.	**Workload:** Attendance time: 56 h Self-study time: 64 h

Course: Linux und Python für Biologen (Internship) The course will take place online. *Course frequency:* Block course during the lecture free time	3 WLH
Examination: Written examination, not graded **Examination requirements:** Independent work with the command line interpreter under the Linux operating system; creation of small programmes in the Python programming language (reading data from files, creating suitable data structures, dealing with regular expressions, implementation of simple algorithms).	4 C

Admission requirements: none	**Recommended previous knowledge:** B.Bio.113
Language: German, English	**Person responsible for module:** Dr. Sophie de Vries
Course frequency: each winter semester; in vorlesungsfreier Zeit	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** 5 - 6
Maximum number of students: 30	

Additional notes and regulations:
The module cannot be taken in combination with B.Bio.117.

Georg-August-Universität Göttingen **Module SK.Bio.310: Ecology of algae**	3 C 2 WLH

Learning outcome, core skills: Nach erfolgreichem Absolvieren des Moduls besitzen die Studierenden Kenntnis der Diversität von Algen und Cyanobakterien in unterschiedlichen Gewässertypen und ihre Veränderung in Bezug auf verschiedene Umweltfaktoren. Sie sind in der Lage Algengruppen aus Gewässerproben zu identifizieren und den Gewässerzustand einzuordnen.	**Workload:** Attendance time: 30 h Self-study time: 60 h

Course: Seminar (1 Kurstag) (Seminar)	
Course: Exkursion	
Course: Algenkurs (4 Kurstage)	
Examination: Oral Report (approx. 15 minutes) **Examination requirements:** Fachinhalt der Seminarvorträge, insbesondere in Bezug auf Verständnis der Diversität von Algen und deren Veränderung in unterschiedlichen Gewässertypen ; Fachvortrag (Sprache und Verständlichkeit der Präsentation, Herstellung eines Bezugs des spezifischen fachlichen Inhalts zu fachübergreifenden Fragestellungen wie z.B. Morphologie und Phylogenie der Algen, Differenzierung unterschiedlicher Gewässertypen, Diskussion)	3 C

Admission requirements: none	**Recommended previous knowledge:** Biologische Grundkenntnisse, B.Bio.127
Language: German	**Person responsible for module:** Prof. Dr. Thomas Friedl
Course frequency: each summer semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** 6
Maximum number of students: 20	

Georg-August-Universität Göttingen **Module SK.Bio.315: Bioethics**	3 C 2 WLH

Learning outcome, core skills:	**Workload:**
Anhand der Lektüre und Diskussion von Texten zu ausgewählten Themen der Bioethik (z. B. Tierethik, Umweltethik, Medizinethik, Gen-Ethik, Forschungsethik) sowie einer allgemeinen Einführung in die Ethik, in moralisches Argumentieren und in die Methoden der Angewandten Ethik erhalten die Studierenden einen Einblick in die moralischen Fragestellungen und Probleme, die sich aus der Anwendung der in ihrem Studium vermittelten naturwissenschaftlichen Kenntnisse und Techniken ergeben, und lernen, wie man über diese moralischen Probleme auf rationale Weise diskutieren kann.	Attendance time: 28 h Self-study time: 62 h

Course: Bioethik (Seminar)	2 WLH
Examination: Written examination (120 minutes) **Examination prerequisites:** regelmäßige Teilnahme am Seminar **Examination requirements:** Kenntnis der im Seminar behandelten Themen der Bioethik. Sachgemäße und differenzierte Erörterung der im Seminar behandelten moralischen Fragestellungen und Probleme sowohl allgemein als auch in der Anwendung auf konkrete Anwendungsbeispiele. Transferfähigkeit der moralischen Argumentation auf im Seminar nicht behandelte moralische Probleme der Bioethik.	3 C

Admission requirements: BSc Bio: mind. 30 Credits aus dem ersten Studienabschnitt	**Recommended previous knowledge:** none
Language: German	**Person responsible for module:** Dr. habil. Jörg Schroth
Course frequency: each semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** 3 - 6
Maximum number of students: 80	

Georg-August-Universität Göttingen **Module SK.Bio.328: Scientific presentation and communication**	3 C

Learning outcome, core skills: The students systematically summarise their research results and present them to an expert audience within the framework of a scientific conference. They are able to represent their own research project in disciplinary and interdisciplinary discourse and deepen their knowledge of representing their own positions in controversial discussions and constructively countering criticism. They develop contacts in the international scientific community and get to know new research and subject areas.	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Active participation in a scientific conference	
Examination: Talk or poster presentation and discussion (15 minutes), not graded **Examination requirements:** The students give a lecture or poster presentation at a scientific conference (national or international) according to the specifications of the respective conference.	3 C

Admission requirements: none	**Recommended previous knowledge:** none
Language: German, English	**Person responsible for module:**
Course frequency: each semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: not limited	

Georg-August-Universität Göttingen **Module SK.Bio.329: Research internship (4 weeks)**	6 C

Learning outcome, core skills: After successful completion of the module, the student can... • demonstrate in-depth knowledge of current topics and research focuses in biology at an institution (MPI, institute abroad, etc.) with special consideration of modern methods • carry out the work carried out independently in connection with current research projects • document and record experiments and theoretical work related to current research projects in accordance with the usual standards.	**Workload:** Attendance time: 160 h Self-study time: 20 h

Course: Forschungspraktikum	
Examination: Ergebnisprotokoll in Form eines wissenschaftlichen Fachartikels (max. 5 Seiten), not graded **Examination prerequisites:** Erfolgreiche Teilnahme an einem mindestens 4-wöchigen Praktikum (160 Std.), Vortrag an der aufnehmenden Institution (entspr. den Gepflogenheiten vor Ort, mind. aber 20 min).	6 C

Examination requirements: Competent presentation of the research approach, the state of research, the methodology used and the results, discussion skills and critical thinking beyond one's own field of work	

Admission requirements: none	**Recommended previous knowledge:** none
Language: German, English	**Person responsible for module:** Dean of studies
Course frequency: each semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: not limited	

Georg-August-Universität Göttingen **Module SK.Bio.331: Research internship (8 weeks)**	12 C

Learning outcome, core skills: After successful completion of the module, the student can... • demonstrate in-depth knowledge of current topics and research focuses in biology at an institution (MPI, institute abroad, etc.) with special consideration of modern methods • carry out the work carried out independently in connection with current research projects • document and record experiments and theoretical work related to current research projects in accordance with the usual standards.	**Workload:** Attendance time: 320 h Self-study time: 40 h

Course: Forschungspraktikum	
Examination: Ergebnisprotokoll in Form eines wissenschaftlichen Fachartikels (max. 5 Seiten), not graded **Examination prerequisites:** Erfolgreiche Teilnahme an einem mindestens 8-wöchigen Praktikum (320 Std.), Vortrag an der aufnehmenden Institution (entspr. den Gepflogenheiten vor Ort, mind. aber 20 min).	12 C

Examination requirements: Competent presentation of the research approach, the state of research, the methodology used and the results, discussion skills and critical thinking beyond one's own field of work	

Admission requirements: none	**Recommended previous knowledge:** none
Language: German, English	**Person responsible for module:** Studiendekanin / Studiendekan
Course frequency: each semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: not limited	

Georg-August-Universität Göttingen **Module SK.Bio.332: Internship for master degree students**	8 C

Learning outcome, core skills: After successful completion of the module ... • the student will have gained insights into the professional practice of biologists and experience in the practical application of methods and techniques as well as the practical implementation of theoretical knowledge in operational processes. • the student is familiar with the interrelationships and interactions of a company with authorities, suppliers, customers, marketing, sales, logistics, administration and research (external and internal) and can reflect on these. • the student is able to establish a connection to his/her previous studies and further study intentions.	**Workload:** Attendance time: 0 h Self-study time: 240 h

Course: Internship (240 hours) *Contents*: The work placement must be completed during the course of study at a facility, institution or company outside the University of Göttingen as described above. The contents are therefore largely determined by the same and in consultation with the student.	
Examination: Internship report (max. 15 pages), not graded	8 C

Examination requirements: The report contains information on the objectives, structure, range of activities, etc., of the institution at which the work placement was carried out as well as information on the activities carried out during the work placement. The report concludes with a critical review and reflection on the activities carried out and the host institution.	

Admission requirements: none	**Recommended previous knowledge:** none
Language: German, English	**Person responsible for module:** Alle Dean of studies
Course frequency: each semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** 2 - 4
Maximum number of students: not limited	

Georg-August-Universität Göttingen **Module SK.Bio.355: Biological psychology I**	3 C 2 WLH

Learning outcome, core skills: Die Studierenden sind in der Lage zentrale Konzepte und Forschungsmethoden der Biopsychologie; Neuro-, Sinnes- und Motorphysiologie, Lernen, Gedächtnis, Aufmerksamkeit, Psychopathologie und Sexualität zu überblicken. Neben dem Wissenserwerb lernen die Studierenden analytisch zu denken, methodisch zu reflektieren sowie kritisch wissenschaftliche Theorien auf die ihnen zu Grunde liegenden empirische Befunde zu untersuchen.	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Biopsychologie I (Lecture)	2 WLH
Examination: Written examination (30 minutes) **Examination requirements:** Die Studierenden erbringen den Nachweis, dass sie in der Lage sind, zentrale Konzepte und Forschungsmethoden der Biopsychologie; Neuro-, Sinnes- und Motorphysiologie, Lernen, Gedächtnis, Aufmerksamkeit, Psychopathologie und Sexualität zu überblicken.	3 C

Admission requirements: Für 2-F-BA: mindestens 20 C aus den Orientierungsmodulen	**Recommended previous knowledge:** Grundkenntnisse in Biologie
Language: German	**Person responsible for module:** Prof. Dr. Stefan Treue
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** 3 - 5
Maximum number of students: 100	

Georg-August-Universität Göttingen **Module SK.Bio.356: Biological psychology II**	3 C 2 WLH

Learning outcome, core skills:	**Workload:**
Nach Abschluss des Moduls besitzen die Studierenden ein Verständnis der zentralen Verarbeitung von Sinnesinformationen und der Generierung von motorischem Verhalten. Sie erwerben Kenntnisse in den Themengebieten Hormone, Stress, Aufmerksamkeit, Chronobiologie, Homöostase, Emotionen und Sprache.	Attendance time: 28 h Self-study time: 62 h

Course: Biologische Psychologie II (Lecture)	2 WLH
Examination: Written examination (30 minutes) **Examination requirements:** Die Studierenden sollen das in der Vorlesung vermittelte Grundwissen der Biopsychologie beherrschen können. Sie sollen die Fähigkeit besitzen, über die gelernten Fakten hinaus Zusammenhänge des Erwerbens von kognitiven Fähigkeiten, Verhaltensmustern und biologischen Grundlagen der Neurobiologie zu verstehen und darzustellen sowie das erworbene Wissen auf neue Situationen anzuwenden.	3 C

Admission requirements:	**Recommended previous knowledge:**
Für 2-F-BA: mindestens 20 C aus den Orientierungsmodulen	SK.Bio.355 Grundkenntnisse der Neurobiologie
Language: German	**Person responsible for module:** Prof. Dr. Stefan Treue
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** 3 - 5
Maximum number of students: 100	

Additional notes and regulations:
Das Modul kann nicht in Kombination mit B.Bio.130 belegt werden.

Georg-August-Universität Göttingen **Module SK.Bio.357: Biological psychology III**	3 C 2 WLH

Learning outcome, core skills: Die Studierenden erwerben Kenntnisse zu erweiterten Grundlagen und Konzepten der neurowissenschaftlichen Biopsychologie in den Bereichen Entwicklung des Nervensystems, Neuroplastizität, Schmerz, Multisensorische Integration, Sensomotorik, Sensorische Informationsverarbeitung, Entscheidungsverhalten, Exekutive Funktionen, Aufmerksamkeit, Psychopharmakologie, Psychopathologie.	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Biologische Psychologie III (Lecture)	2 WLH
Examination: Written examination (60 minutes) **Examination requirements:** Die Studierenden erbringen den Nachweis, dass sie die oben genannten Lernziele erreicht haben.	3 C

Admission requirements: none	**Recommended previous knowledge:** SK.Bio.355, SK.Bio.356
Language: German	**Person responsible for module:** Prof. Dr. Alexander Gail
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** 3 - 5
Maximum number of students: 20	

Georg-August-Universität Göttingen **Module SK.Bio.360: Introduction to biotechnology**	3 C 2 WLH

Learning outcome, core skills: Nach der Teilnahme an der Vorlesung sollen Studierende über grundlegende Kenntnisse der molekularen Genetik (Pro- und Eukaryoten, Aufbau RNA und DNA, Replikation, Transkription, Translation, Genexpression) verfügen sowie Techniken der Molekularbiologie (Klonierung, PCR und cDNA-Synthese, Sequenzierung, Hybridisierungstechniken, Antibiotika) und der Biochemie (Proteinproduktion und -aufreinigung, Elektrophorese, Nachweismethoden) kennen, die es ihnen erlauben, aktuelle Themengebiete der Molekularbiologie zu verstehen. Sie haben verschiedene biotechnologische Anwendungsbeispiele aus der grünen und roten Gentechnik sowie zu land- und wasserlebenden Tieren kennen gelernt und können die Relevanz aktueller molekularbiologischer Themen beurteilen.	**Workload:** Attendance time: 30 h Self-study time: 60 h

Course: Genetik und Biotechnologie (Lecture)	2 WLH
Examination: Written examination (90 minutes) **Examination requirements:** Theoretische Grundlagen zum Verständnis von aktuellen Themen aus der Genetik und Biotechnologie.	3 C

Admission requirements: none	**Recommended previous knowledge:** none
Language: German	**Person responsible for module:** Prof. Dr. Stefanie Pöggeler
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** 3 - 5
Maximum number of students: 10	

Additional notes and regulations:
Ausschluss: Nicht belegbar in Kombination mit B.Bio.129 (für Studierende im BSc Biologie/Biodiversität) oder mit M.Bio.203 (für Studierende im Master of Education mit Fach Biologie)

Georg-August-Universität Göttingen **Module SK.Bio.370: Molecular zoology: Topics and methods**	6 C 8 WLH

Learning outcome, core skills: Molecular methods have become indispensable in zoology. This module addresses students who want to learn experimental approaches to molecular genetic investigations and to acquire the relevant skills for practical laboratory work. Additionally, it provides an overview of various current issues of molecular zoology and the application of molecular methods in insect pest control and insect biotechnology. Learning outcome: • basic knowledge of molecular work and different experimental approaches (i.a. DNA work, cloning, sequencing, sequence analysis). • basics of gene function in animals • methods of gene function analysis (i.a. genetic screens, reverse genetics (RNAi), genome editing (CRISPR / Cas9), transgenesis) • advantages and disadvantages of different molecular model systems • overview of current research topics of molecular zoology (i.a. evolution and development (“EvoDevo”), “EcoDevo”, sex determination, molecular communication, chronobiology) • molecular methods in insect biotechnology • After completing the module, the students should be able to: • design and perform molecular biological experiments (i.a. DNA extraction, plasmid preparation, PCR, restriction digestion, cloning). • handle databases with information on gene structure and gene function. • choose appropriate model systems and methods for certain zoological questions and develop experimental strategies.	**Workload:** Attendance time: 112 h Self-study time: 68 h

Course: Gene function analysis in diverse animals and applications in pest control (Lecture)	1 WLH
Course: Current research in molecular zoology and biotechnology (Seminar)	1 WLH
Course: Introduction to molecular work and methods for gene function studies (Exercise)	6 WLH
Examination: Lecture (approx. 30 minutes) **Examination prerequisites:** Regular participation in the practical course **Examination requirements:** Understanding and scientific presentation of topics of molecular zoology in a talk (20 minutes) followed by a discussion (about 10 minutes).	6 C

Admission requirements: B.Bio.102, B.Bio.105, B.Bio.106	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Gregor Bucher

Course frequency:	**Duration:**
each summer semester; 3 weeks block course	1 semester[s]
Number of repeat examinations permitted:	**Recommended semester:**
twice	5
Maximum number of students:	
5	

Additional notes and regulations:

The combination of this module with module B.Biodiv.370 or M.Biodiv.446 is not possible.

The module takes place as a three-week block course.

Georg-August-Universität Göttingen **Module SK.Bio.380: Magnetic Resonance Imaging: Principles and Applications**	6 C 4 WLH

Learning outcome, core skills: Die Studierenden erlangen Kenntnisse über die generellen physikalischen Grundlagen der MRT (NMR, Bildgebung, Kontraste), die verschiedenen MRT Modalitäten (MR-Spektroskopie, strukturelle MRI, funktionelle MR, Echtzeit-MR), Spezifika der MRT beim Tier, Tiermodelle, strukturelle und funktionelle MRT beim Menschen, Analysemethoden der aufgaben-basierten funktionellen MRT (Preprocessing, uni- und multivariate Analyseansätze), resting-state funktionelle MRT, interventionelle MRT und Kombination der Methoden in der multimodalen MRT. Nach Abschluss des Moduls haben die Studierenden das Wissen und das Verständis für die zugrunde liegenden Mechanismen und Konzepte sowohl der MRT-Messtechniken, als auch der Analysemethoden entwickelt. Dies beinhaltet das Wissen über die angemessene Anwendung und die Grenzen der Methoden und Analysen. Die Studierenden sind in der Lage, im Transfer die Angemessenheit von wissensschaftsjournalistischen und Medienberichten über MRT-Studien und deren Ergebnisse fundiert beurteilen zu können.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Einführung in Prinzipien und Anwendungen der MRT (Lecture) *Contents*: Grundprinzipien sowohl der unterschiedlichen MRT-Modalitäten als auch der verschiedenen MRT-Analyseansätze	2 WLH
Course: MRT in Biologie und Psychologie (Seminar) *Contents*: Vorstellung und Diskussion der angemessenen Passung von MR-Methodik, Analyse und wissenschaftlichen Fragestellung an entsprechenden Literaturbeispielen.	2 WLH
Examination: Written examination (120 minutes) **Examination prerequisites:** Regelmäßige Teilnahme am Seminar und Vortrag (ca. 20 Minuten) mit anschließender Diskussion (ca. 10 Minuten)	6 C

Examination requirements: Verständnis und wissenschaftliche Darstellung von Themen der MRT	

Admission requirements: none	**Recommended previous knowledge:** none
Language: German	**Person responsible for module:** Prof. Dr. Susann Boretius
Course frequency: each summer semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** 4

Maximum number of students: 24	

Georg-August-Universität Göttingen **Module SK.Bio.7002: Basic virology**	3 C 2 WLH

Learning outcome, core skills: The students will become familiar with the architecture of viruses and will learn how these agents replicate and evade the immune response of the host. Moreover, it will be discussed how viruses cause disease and how this process can be prevented by antivirals and vaccines. The lectures will focus on important human pathogens, including HIV, influenza and herpesviruses. Upon successful completion of the module, the students will be able to classify viruses and will have an understanding of central mechanisms underlying virus replication and pathogenesis and their inhibition by therapy and vaccination.	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Basic virology (Lecture)	2 WLH
Examination: Written examination (45 minutes)	3 C

Examination requirements: The students must assess whether statements regarding basic aspects of virology, including virus classification, viral replication, virus-host interactions, pathogenesis, immune evasion and antiviral therapy and vacciantion, are correct.	

Admission requirements: none	**Recommended previous knowledge:** Basic knowledge in Biology
Language: English	**Person responsible for module:** Prof. Dr. Stefan Pöhlmann
Course frequency: each semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** 3 - 6
Maximum number of students: 100	

Georg-August-Universität Göttingen **Module SK.Bio.7004: Environmental microbiology**	3 C 2 WLH

Learning outcome, core skills: The students will acquire a comprehensive understanding of basic microbial processes in the environment. Students will learn how microorganisms are effective in biogeochemical cycles and how these cycles evolved in Earth's history and shaped our biosphere. They will gain knowledge about important microbial habitats (terrestrial/ aquatic/extreme), and their microbial diversity. They will be introduced in the application of microorganisms in bioremediation and environmental biotechnology.	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Environmental microbiology (Lecture)	2 WLH
Examination: Oral Presentation (approx. 5 minutes)	3 C

Examination requirements: Revising a specific topic in environmental microbiology, compilation of data and preparation/short presentation of a scientific poster.	

Admission requirements: B.Bio.118	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Rolf Daniel PD Dr. Michael Hoppert
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** 5 - 6
Maximum number of students: 25	

Georg-August-Universität Göttingen **Module SK.Bio.7006: Microbiology of marine and terrestrial habitats**	6 C 6 WLH

Learning outcome, core skills: The students will experience microbial life in extreme environments. Destinations for this excursion will be deep biosphere habitants, hydrothermal springs and marine environments, influenced by rapidly changing salinity (Northern Apennines, Tuscany, Giglio Island). Environmental parameters will be recorded on site, microbial diversity will be estimated and samples for analysis of environmental DNA will be taken and prepared in the field. The aim is the evaluation of microbial diversity and correlation with environmental parameters in a specific site. Students will learn methods for field studies and basic techniques in environmental microbiology. They will gain knowledge in microbial diversity in a specific habitat and in adaptations of microbes in extreme environments.	**Workload:** Attendance time: 84 h Self-study time: 96 h

Course: Preparatory seminar	1 WLH
Course: Microbiology of marine and terrestrial habitats (Excursion) *Course frequency:* block (2 weeks) each summer semester	5 WLH
Examination: written report (max. 20 pages) **Examination prerequisites:** seminar talk, reviewing a focused topic in environmental microbiology related to the excursion, 20 minutes	6 C

Examination requirements: Knowledge on • field work and data processing related to environmental microbiology (sampling, assessment of environmental parameters, sample preparation for diversity analysis) • biotic and abiotic factors shaping a specific habitat • key microbial communities in various environments	

Admission requirements: B.Bio.118, SK.Bio.7004 no requirements needed for students of the MSc MB programme	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Rolf Daniel PD. Dr. Michael Hoppert
Course frequency: each summer semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 6	

Georg-August-Universität Göttingen **Module SK.Bio.7007: Methods in molecular virology**	3 C 2 WLH

Learning outcome, core skills: The students are introduced to the repertoire of methods used in virological research and diagnostics. The course focuses on current developments and seminal experiments from the past. The students will train their ability to extract scientific methods from the literature by themselves and to devise their own strategies to tackle a scientific problem. Students are encouraged to develop their own strategies to solve a specific problem and to discuss their strategies with their fellow students. The students are encouraged to come up with alternative approaches. The students' solutions are compared to published techniques, which are presented in the form of a short talk by a student or the teacher.	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Methods in molecular virology (Seminar)	2 WLH
Examination: Lecture (approx. 30 minutes), not graded **Examination prerequisites:** Regular participation in the seminar	3 C

Examination requirements: Understanding and scientific presentation of methods in molecular virology in a seminar talk (approx. 20 minutes) with subsequent discussion (approx. 10 minutes).	

Admission requirements: none	**Recommended previous knowledge:** basic knowledge in virology (e.g. SK.Bio.7002), basic knowledge in molecular biology
Language: English	**Person responsible for module:** Dr. Alexander Hahn
Course frequency: each semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** 4 - 6
Maximum number of students: 15	

Georg-August-Universität Göttingen **Module SK.Bio.7008: Molecular biology of HIV replication and pathogenesis**	2 C 1 WLH

Learning outcome, core skills:	**Workload:**
The students will learn the molecular mechanisms underlying the different steps of HIV replication, including entry, reverse transcription, genome integration, gene expression, assembly, release and maturation. Moreover, innate antiviral defenses and viral countermeasures will be discussed. In addition, insights into humoral immune responses against HIV and challenges associated with the generation of an effective vaccine will be provided. Finally, concepts and components of antiretroviral therapy will be introduced and the zoonotic origin of HIV will be discussed. Students attending the lectures will acquire an understanding of central mechanisms underlying HIV replication and pathogenesis and their blockade by immune responses and antiviral therapy.	Attendance time: 14 h Self-study time: 46 h

Course: Molecular biology of HIV replication and pathogenesis (Lecture)	1 WLH
Examination: Written examination (45 minutes)	2 C

Examination requirements:	
The students should be able to respond to questions concerning basic aspects of HIV replication, pathogenesis, immune responses and antiviral therapy.	

Admission requirements: none	**Recommended previous knowledge:** SK.Bio.7002
Language: English	**Person responsible for module:** Prof. Dr. Stefan Pöhlmann
Course frequency: each semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 30	

Georg-August-Universität Göttingen **Module SK.Bio.7009: Learning with a core facility - protein analytics using mass spectrometry**	3 C 3 WLH

Learning outcome, core skills: In the first part of the course, the students get an introduction to the analysis of proteins using liquid chromatography-coupled mass spectrometry (LCMS), and they will prepare peptide samples themselves for this analysis technique in a practical part. Protein samples derive from current projects of different research groups at the Göttingen Campus. In the second part, the students will learn how to analyze the LCMS raw data for identification and relative quantification of proteins. Approaches for the statistical validation of the results will be introduced. The students will get the opportunity to analyze data on their own with state-of-the-art software tools. They will present their results of their project to their fellow students in a concluding seminar at the end of the course.	**Workload:** Attendance time: 40 h Self-study time: 50 h

Course: Protein analytics using mass spectrometry (Course) Practical course and data analysis software training are supervised by members of two core facilities – LCMS Protein Analytics and Medical Biometry and Statistical Bioinformatics	3 WLH
Examination: Oral Presentation (approx. 15 minutes), not graded **Examination prerequisites:** Regular participation in the practical course	3 C

Examination requirements: The students should present the results of their experiment in English.	

Admission requirements: none	**Recommended previous knowledge:** B.Bio.129 or B.Bio.118 or B.Bio.112 or equivalent Practical experience with protein techniques (e.g. SDS-PAGE)
Language: English	**Person responsible for module:** Dr. Oliver Valerius
Course frequency: winter or summer semester, on demand	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** 5 - 6
Maximum number of students: 20	