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 46/2017 S. 1180)

Modules

Index by areas of study

I. Master-Studiengang "Molecular Life Sciences: Microbiology, Biotechnology and Biochemistry"

Es müssen Leistungen im Umfang von insgesamt wenigstens 120 C erfolgreich absolviert werden.

1. Fachstudium

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

a. Fachmodule

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

b. Vertiefungsmodule I

Es muss eines der folgenden Vertiefungsmodule I im Umfang von 12 C erfolgreich absolviert werden; Zugangsvoraussetzung ist der erfolgreiche Abschluss des jeweils zugehörigen Fachmoduls.

c. Vertiefungsmodule II

Es muss eines der folgenden Vertiefungsmodule II im Umfang von 12 C erfolgreich absolviert werden, Zugangsvoraussetzung ist der erfolgreiche Abschluss des jeweils zugehörigen Fachmoduls.

2. Professionalisierungsbereich

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

a. Wahlpflichtmodule

aa. Profilmodul

Es muss ein weiteres Wahlpflichtmodul (Profilmodul) im Umfang von mindestens 12 C erfolgreich absolviert werden. Dies kann neben dem Profilmodul M.Bio.110 ein noch nicht belegtes Fachmodul nach Nr.1 Buchstabe a oder ein beliebiges Fachmodul des biologischen Master-Studiengangs "Developmental, Neural, and Behavioral Biology" oder des Master-Studiengangs "Chemie" sein. Soll das Profilmodul aus mehreren Modulen zusammengesetzt werden oder sollen Module anderer Studiengänge belegt werden, bedarf dies der Genehmigung durch die Prüfungskommission; dies ist durch die Studierende oder den Studierenden zu beantragen und zu begründen. Ein Grund liegt vor, wenn die Belegung von mehreren Modulen oder von Modulen außerhalb der Fakultät für Biologie und Psychologie oder der Fakultät für Chemie studienzielfördernd ist.

bb. Schlüsselkompetenzmodule

Es müssen Wahlpflichtmodule für den Erwerb von Schlüsselkompetenzen im Gesamtumfang von wenigstens 12 C erfolgreich absolviert werden. Folgende Module können aus dem Angebot des Studiengangs gewählt werden; die Module M.Bio.141 bis M.Bio.144, M.Bio.151 bis M.Bio.153 sowie M.Bio.161 bis M.Bio.173 können nicht in Kombination mit dem jeweils zugehörigen Fachmodul (M.Bio.101 bis M.Bio.104) belegt werden.

Darüber hinaus können alle Schlüsselkompetenzmodule aus dem Angebot des Master-Studiengangs "Developmental, Neural, and Behavioral Biology", des Master-Studiengangs "Chemie" oder Module aus dem universitätsweiten Modulverzeichnis Schlüsselkompetenzen sowie der zentralen Einrichtung für Sprachen und Schlüsselqualifikationen (ZESS) gewählt werden. Die Zulassung weiterer Module kann von der oder dem Studierenden bei der Prüfungskommission beantragt werden; der Antrag kann ohne Angabe von Gründen abgelehnt werden; ein Rechtsanspruch der oder des antragstellenden Studierenden besteht nicht. Es wird empfohlen, Zusatzveranstaltungen wie Exkursionen im Rahmen des Angebots zu belegen.

cc. Deutsch als Fremdsprache

Studierende, welche Deutschkenntnisse nicht wenigstens auf dem Niveau B2 des gemeinsamen europäischen Referenzrahmens für Sprachen nachweisen können, müssen an Stelle von Modulen nach Buchstaben ii. Module im Umfang von wenigstens 6 C zum Erwerb weiterer Deutschkenntnisse nach Maßgabe der Prüfungs- und Studienordnung für Studienangebote für ausländische Studierende des Lektorats Deutsch als Fremdsprache absolvieren.

b. Pflichtmodule

Es müssen folgende Pflichtmodule im Umfang von insgesamt 6 C erfolgreich absolviert werden.

3. Masterarbeit

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 Teilnehmer 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 Kursteilnehmer 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.	**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 Mata
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:**
Maximum number of students: 23	

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

Learning outcome, core skills:	**Workload:**
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.	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.	

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

Additional notes and regulations:
Wiederholbarkeit für BSc Biochemie: zweimalig

Georg-August-Universität Göttingen **Module B.Che.3904: Basics in Radiochemistry**	6 C 8 WLH

Learning outcome, core skills: Nach erfolgreichem Abschluss des Moduls kann der/die Studierende • den Aufbau und die Mechanismen der Stabilität bzw. den Zerfall von Kernen verstehen; • Gesetzmäßigkeiten der Zerfallscharakteristiken mathematisch berechnen • die Wechselwirkung verschiedener Strahlenarten mit Materie nachvollziehen • die radiochemischen Gewinnung von Nukliden und die Technik von Markierungen verstehen • eine Nutzung von Radionukliden in Forschung und Industrie (Altersbestimmung, Tracermethoden, Herstellung geeigneter Nuklide, Entsorgung, Strahlenchemie u.a.) beurteilen • durch die im Praktikumsteil erworbenen Fähigkeiten den Umgang von radioaktiven Präparaten und die Anwendung moderner, hochempfindlicher Analyseverfahren beherrschen	**Workload:** Attendance time: 112 h Self-study time: 68 h

Course: Einführung in die Radiochemie (Lecture)	2 WLH
Course: Anwendung radioaktiver Isotope (Internship)	6 WLH
Examination: Written examination (180 minutes) **Examination prerequisites:** 8 testierte Praktikumsprotokolle im Umfang von 3 bis 5 Seiten	6 C

Examination requirements: *Teilmodul 1*: Zerfallsarten und -gesetze, Wechselwirkung mit Materie, Isotopieeffekte, Energiebilanz, Isotopengewinnung, Markierungsarten, Strahlungsnachweis, Dosisbegriffe, Anwendung *Teilmodul 2*: Isotopenaustausch, Aktivierung, radioaktives Gleichgewicht, Nuklidgeneratoren, Retention, Wirkungsgrade, Kalibrierung von Messgeräten	

Admission requirements: Erfüllung der gesetzlichen Bestimmungen für Arbeiten im Kontrollbereich	**Recommended previous knowledge:** B.Che.1002
Language: German	**Person responsible for module:** Prof. Dr. Götz Eckold
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:**
Maximum number of students: 14	

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

Learning outcome, core skills: **Learning outcome:** 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. **Methods course:** Acquisition of biomolecular, genetic, and biochemical techniques for manipulation and analysis through experiments from current fields of research, e.g. structural analysis and classification of bacteria, transformation, isolation of DNA, sequencing of DNA, diagnostic and Real-time PCR, fluorescence microscopy, enzyme assays, cloning, protein purification. **Core skills:** Knowledge of microorganisms relevant for biotechnology and medicine, ability to identify these organisms and to analyse them with molecular methods.	**Workload:** Attendance time: 196 h Self-study time: 164 h

Course: General and applied microbiology (Lecture)	3 WLH
Course: General and applied microbiology (Seminar)	1 WLH
Course: Methods course: Signal transduction in bacteria (Practical course) or	
Course: Methods course: Isolation and characterisation of biotechnologically relevant microorganisms (Practical course)	10 WLH

Examination: Written examinationwritten examination covering lecture topics (90 minutes) **Examination prerequisites:** regular attendance, testified protocol and testified oral presentation (ca. 15 min)	

Examination requirements: • detailed knowledge in cell biology, biochemistry and genetics of procaryotic microorgansims • deepened knowledge of molecular biological, genetic and biochemical techniques to analyze procaryotes	

Admission requirements: can't be combined with key competence module 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: Advanced knowledge of molecular genetics and microbial cell biology through case studies of model systems of molecular mycology (yeasts and filamentous fungi). Acquisation of knowledge up to the "Review" level in one topic. **Methods course:** Research and project orientated acquisition of biomolecular, genetic, biochemical and cell biological techniques in the involved departments in small groups.	**Workload:** Attendance time: 196 h Self-study time: 164 h

Course: Molecular genetics and microbial cell biology (Lecture)	3 WLH
Course: Molecular genetics and microbial cell biology (Seminar)	1 WLH
Course: Methods course: Genetics/Cell biology A (Practical course) oder	10 WLH
Course: Methods course: Genetics/Cell biology B (Practical course)	10 WLH

Examination: Written examination and oral presentation **Examination prerequisites:** regular attendance, testified protocol	

Examination requirements: • detailed knowledge in cell biology, biochemistry and genetics of eucaryotic microorgansims • deepened knowledge of molecular biological, genetic and biochemical techniques to analyze eucaryotes	

Admission requirements: can't be combined with key competence module M.Bio.142	**Recommended previous knowledge:** • Watson, Molecular Biology of the Gene, Pearson, 6th Edition; • Alberts, Molecular Biology of the Cell, Garland, 5th Edition
Language: English	**Person responsible for module:** Prof. Dr. Gerhard Braus
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.104: Cellular and molecular biology of plant-microbe interactions**	12 C 14 WLH

Learning outcome, core skills: Introduction into theory and methods for the analysis of plant-microbe interactions on the cell biological and molecular level. Acquisition of basic methods used in the field of plant-microbe interaction, e. g. infection with bacterial, viral and fungal pathogens and their quantification by appropriate techniques (staining techniques, light microscopy, colony counting, spores, ELISA assay, PCR), PAMP induction of basal defense mechanisms and their analysis (detection of reactive oxygen species and activated MAP kinases), quantification of pathogen-induced genes using Real-time RT PCR, analysis of protein-protein interactions (yeast two-hybrid analysis, biomolecular fluorescence complementation), analysis of transient gene expression after gene tranfer into protoplasts (PEG) or Particle Bombardment, analysis of DNA-protein interaction using Electrophoretic Mobility Shift Assay (EMSA), localisation of GFP-labeled proteins using fluorescence microscopy.	**Workload:** Attendance time: 147 h Self-study time: 213 h

Course: Plant-microbe interactions (Lecture)	3 WLH
Course: Plant-microbe interactions (Seminar)	1 WLH
Course: Methods course: Plant-microbe interactions (Practical course)	10 WLH

Examination: Written examinationwritten examination covering topics of the lecutre and the methods course (90 minutes) (90 minutes) **Examination prerequisites:** regular attendance, oral presentation within seminar (15 min)	12 C

Examination requirements: • knowledge of basic concepts in plant-microbe-interactions • competence to critically read, present and discuss sientific publications in plant-microbe-interactions • knowledge of basic methods in plant-microbe-interactions	

Admission requirements: can't be combined with key competence module 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:	

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

Learning outcome, core skills: Methods in Structural Biochemistry, structure and function of biological macromolecules. Structure and folding of proteins, structure-function relationships, protein-protein and protein-nucleic acid complexes. Structure-based drug-design, molecular recognition. Handling of state of the art equipment, critical dealing with current biochemical topics, detailed analysis of experiments and their presentation. Independent acquisition of professional knowledge from publications by active participation in the seminar.	**Workload:** Attendance time: 196 h Self-study time: 164 h

Course: Structural biology (Lecture)	3 WLH
Course: Structural biology (Seminar)	1 WLH
Course: Structural biology (Practical course) *Contents*: Preparation of proteins and protein-RNA-complexes via affinity-, ion exchange- or gel filtration chromatography as well as ultracentrifugation. Characterization of recombinant proteins and macromolecular complexes (gel electrophoresis, spectroscopic methods). Biochemical analysis of protein-RNA-complexes, crystallization of proteins. Structural resolution of biological macromolecules using X-ray crystallography and cryo electron microscopy. Studies on dynamics and function of molecular machines.	10 WLH

Examination: Written examination (90 minutes) **Examination prerequisites:** regular participation in practical course and protocol (max. 20 pages)	12 C

Examination requirements: knowledge of the basics in structural biochemistry, especially: * biochemical and analytic methods used in the characterization of proteins and macromolecular complexes * characteristics of selected proteins and protein complexes * the basics of structural resolution and the structural characteristics of proteins and nucleic acids	

Admission requirements: can't be combined with key competence modules M.Bio.156 and M.Bio.166	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Ralf Ficner
Course frequency: each winter 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: Molecular biochemistry and biophysics of different classes of biomolecules, plant primary and secondary metabolism, lipid metabolism, lipids as signal molecules and secondary metabolites, biotechnological utilization and modification of storage substances, enzymes of lipid metabolism, modern biophysical methods for analysis of biomolecules Handling of state of the art equipment, critical dealing with current biochemical topics, detailed analysis of experiments and their presentation. Independent acquisition of professional knowledge from publications by active participation in the seminar.	**Workload:** Attendance time: 196 h Self-study time: 164 h

Course: Biochemistry and Biophysics (Lecture)	3 WLH
Course: Biochemistry and Biophysics (Tutorial)	1 WLH
Course: methods course: Biochemistry and Biophysics (Practical course) *Contents*: Biochemical analysis of carbohydrates, lipids, proteins and nucleic acids using photometric assays, electrophoresis, thin layer chromatography as well as fully automated analysis tools (HPLC/GC/GCMS). Spectroscopy of biomolecules (fluorescence, FT-IR, CD, UV/Vis), modern microscopy techniques (optical microscopy, scanning probe techniques), functional analysis of different membrane protein classes	10 WLH

Examination: Written examination (90 minutes) **Examination prerequisites:** regular participation in methods course and protocol (max. 20 pages)	12 C

Examination requirements: • basic knowledge of different classes of biomolecules and their metabolism • knowledge about spectroscopy of molecules • biotechnologic techniques using plants	

Admission requirements: can't be combined with M.Bio.157	**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: 48	

Georg-August-Universität Göttingen **Module M.Bio.108: Enzyme catalysis and biological chemistry**	12 C 14 WLH

Learning outcome, core skills: Catalytic mechanisms of enzymes, mechanisms of macromolecular complexes, biocatalysis, kinetics und thermodynamics of biochemical reactions, chemical model systems of enzymes, synthesis of biooligomers, synthesis of ligands, ligation techniques, array technologies Handling of state of the art equipment, critical dealing with current biochemical topics, detailed analysis of experiments and their presentation. Independent acquisation of professional knowledge from publications by active participation in the seminar.	**Workload:** Attendance time: 196 h Self-study time: 164 h

Course: Enzyme Catalysis and Chemical Biology (Lecture)	3 WLH
Course: Enzyme Catalysis and Chemical Biology (Seminar)	1 WLH
Course: methods course: Enzyme Catalysis and Chemical Biology (Practical course) *Contents*: recombinant expression of enzymes and purification by chromatographic methods (gel filtration, affinity and ion exchange chromatography), kinetic characterisation of enzymatic reactions by steady-state assays and transient kinetics (stopped-flow, quench-flow), thermodynamic characterisation of enzyme : inhibitor or enzyme : substrate interactions by spectroscopic methods (circular dichroism, fluorescence spectroscopy, UV-Vis spectroscopy, NMR spectroscopy) as well as microcalorimetric methods (ITC), chemical synthesis of biooligomers and of ligands, synthesis of organic and inorganic (metallo-)complexes	10 WLH

Examination: Written examination (90 minutes) **Examination prerequisites:** regular participation in practical course and protocol (max. 20 pages) **Examination requirements:** • knowledge about catalytic mechanisms of enzymes • knowledge about kinetics and thermodynamics of biochemical reactions • knowledge about different organic synthesis mechanisms	12 C

Examination requirements: Knowledge of catalytic mechanisms of enzymes as well as of kinetic and thermodynamic analysis of biochemical reactions, knowledge of the sysnthesis of biooligomers and ligands.	

Admission requirements: can't be combined with key competence module M.Bio.157	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Kai Tittmann
Course frequency:	**Duration:**

each summer semester	1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** 2
Maximum number of students: 20	

Georg-August-Universität Göttingen **Module M.Bio.110: International Competition on Genetically Engineered Machines (iGEM) - profile module**	12 C 14 WLH

Learning outcome, core skills: The students acquire the basic concepts of synthetic biology. They are familiar with the principles of using biobricks. They know how to design, develop, produce and evaluate biobricks in the framework of an applied project. The students learn how to apply microbiological, biochemical and genetic methods, among them molecular cloning, protein expression and analysis, reporter gene analysis, fluorescence microscopy.	**Workload:** Attendance time: 196 h Self-study time: 164 h

Course: Advances in Synthetic biology (Seminar)	2 WLH
Course: practical course: iGEM	12 WLH

Examination: Oral Presentation (approx. 30 minutes), not graded **Examination prerequisites:** regular attendance and participation in practical work, seminars and human practice measures **Examination requirements:** Die Studierenden präsentieren Ihr Projekt beim europäischen Vorausscheid.	12 C

Examination requirements: Self-organized practical teamwork to solve a scientific project. Presentation of the results at the national and international level.	

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

Georg-August-Universität Göttingen **Module M.Bio.111: General and applied microbiology - advanced module I**	12 C 20 WLH

Learning outcome, core skills: Students are able to perform specific microbiological and biomolecular techniques independently. They know how to record, interpret and present their experimental results in written form.	**Workload:** Attendance time: 280 h Self-study time: 80 h

Course: Lab course I, 7 weeks	20 WLH

Examination: Oral examination (approx. 30 minutes) **Examination prerequisites:** testified protocol in form of a scientific publication (paper) or oral presentation (in agreement with supervisor)	

Examination requirements: profound knowledge of a specific research field, including molecular biological and microbiological techniques	

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: 15	

Georg-August-Universität Göttingen **Module M.Bio.112: Molecular genetics and microbial cell biology - Advanced module I**	12 C 20 WLH

Learning outcome, core skills: Students are able to perform specific genetic, biomolecular and cell biological techniques independently and their ability to record, interpret and present their experimental results in written form.	**Workload:** Attendance time: 280 h Self-study time: 80 h

Course: Lab course, 7 weeks	20 WLH

Examination: Minutes / Lab report (max. 10 pages)	

Examination requirements: profound knowledge of a specific research field, including molecular biological and microbiological techniques	

Admission requirements: M.Bio.102	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Gerhard Braus
Course frequency: each 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.114: Cellular and molecular biology of plant-microbe interactions - advanced module I**	12 C 20 WLH

Learning outcome, core skills: Students prove their ability to perform techniques from the area of cell and molecular biology of plant-microbe interactions independently and to record, interpret and present their experimental results.	**Workload:** Attendance time: 280 h Self-study time: 80 h

Course: Lab course, 7 weeks	20 WLH

Examination: Oral examination (approx. 30 minutes) **Examination prerequisites:** testified protocol in form of a scientific publication (paper)	

Examination requirements: detailed knowledge of a specific research topic, including the associated molecular biological, genetic, biochemical and cell biological techniques	

Admission requirements: M.Bio.104	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Christiane Gatz Prof. Dr. Volker Lipka
Course frequency: each 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.116: Structural biochemistry - advanced module I**	12 C 20 WLH

Learning outcome, core skills: Students prove their ability to perform specific biochemical, structure biological and biomolecular techniques independently and their ability to record, interpret and present their experimental results in written form. Acquisation of profound knowledge about current biochemical problems. Handling of state of the art equipment, critical dealing with current biochemical topics, detailed analysis of experiments and their presentation. Independent acquisation of professional knowledge from publications.	**Workload:** Attendance time: 280 h Self-study time: 80 h

Course: Lab course, 7 weeks	20 WLH

Examination: Oral examination (approx. 30 minutes) **Examination prerequisites:** testified protocol in form of a scientific publication (paper) or testified poster about experimental results	12 C

Examination requirements: • detailled knowledge of analytical methods in chromatography, structural biology and biochemistry • ability to utilize these methods in order to answer scientific questions • knowledge about the research topics in the department	

Admission requirements: M.Bio.106 *recommended:* M.Bio.103: Core module "Biochemistry and structural biology"	**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: Biochemistry and biophysics - advanced module I**	12 C 20 WLH

Learning outcome, core skills: Students prove their ability to perform specific biochemical, structure biological and biomolecular techniques independently and their ability to record, interpret and present their experimental results in written form. Acquisation of profound knowledge about current biochemical problems. Handling of state of the art equipment, critical dealing with current biochemical topics, detailed analysis of experiments and their presentation. Independent acquisation of professional knowledge from publications.	**Workload:** Attendance time: 280 h Self-study time: 80 h

Course: Lab course, 7 weeks	20 WLH

Examination: Oral examination (approx. 30 minutes) **Examination prerequisites:** testified protocol in form of a scientific publication (paper) or testified poster about experimental results	12 C

Examination requirements: • detailled knowledge of analytical methods in chromatography, structural biology and biochemistry • ability to utilize these methods in order to answer scientific questions • knowledge about the research topics in the department	

Admission requirements: M.Bio.107 *recommended:* M.Bio.103: Core module "Biochemistry and structural biology"	**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: 10	

Georg-August-Universität Göttingen **Module M.Bio.118: Enzyme catalysis and biological chemistry - advanced module I**	12 C 20 WLH

Learning outcome, core skills: Students prove their ability to perform specific biochemical, enzyme catalytical, spectroscopic, thermodynamic and synthetic techniques independently and their ability to record, interpret and present their experimental results in written form. Acquisition of profound knowledge about current emzyme biological and bio(in)organic problems. Handling of state of the art equipment, critical dealing with current enzyme biology/chemistry topics, detailed analysis of experiments and their presentation. Independent acquisation of professional knowledge from publications	**Workload:** Attendance time: 280 h Self-study time: 80 h

Course: lab rotation	20 WLH

Examination: Oral examination (approx. 30 minutes) **Examination prerequisites:** testified protocol in form of a scientific publication ("paper") or testified poster about experimental resultsr die Praktikumsergebnisse	12 C

Examination requirements: • detailled knowledge of chromatographic, cinetic, thermodynamic, spectroscopic and synthetic methods • ability to utilize these methods in order to answer scientific questions • knowledge about the research topics in the department	

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: General and applied microbiology - advanced module II**	12 C 20 WLH

Learning outcome, core skills: Students are able to perform specific microbiological and biomolecular techniques independently. They know how to record, interpret and present their experimental results in written form.	**Workload:** Attendance time: 280 h Self-study time: 80 h

Course: Lab course II, 7 weeks	20 WLH

Examination: Oral examination (approx. 30 minutes) **Examination prerequisites:** testified protocol in form of a scientific presentation ("paper") or a testified poster based on the lab course results or a scientific oral presentation (in agreement with supervisor)	

Examination requirements: profound knowledge of a specific research field, including molecular biological and microbiological techniques	

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: 12	

Georg-August-Universität Göttingen **Module M.Bio.122: Molecular genetics and microbial cell biology - advanced module II**	12 C 20 WLH

Learning outcome, core skills: Students are able to perform specific genetical, biomolecular and cell biological techniques independently and their ability to record, interpret and present their experimental results in written form.	**Workload:** Attendance time: 280 h Self-study time: 80 h

Course: Lab course, 7 weeks, and one week composition of a poster	20 WLH

Examination: Oral PresentationGraded poster based on lab course results. (approx. 30 minutes)	

Examination requirements: profound knowledge of a specific research field, including molecular biological and microbiological techniques	

Admission requirements: M.Bio.102	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Gerhard Braus
Course frequency: each 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.124: Cellular and molecular biology of plant-microbe interactions - advanced module II**	12 C 20 WLH

Learning outcome, core skills: Students prove their ability to perform techniques from the area of cell and molecular biology of plant-microbe interactions independently and to record, interpret and present their experimental results.	**Workload:** Attendance time: 280 h Self-study time: 80 h

Course: Lab course, 7 weeks	20 WLH

Examination: Oral examination (approx. 30 minutes) **Examination prerequisites:** testified protocol in form of a scientific publication (paper) or a testified poster based on the lab course results	

Examination requirements: detailed knowledge of a specific research topic, including the associated molecular biological, genetic, biochemical and cell biological techniques	

Admission requirements: M.Bio.104	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Christiane Gatz Prof. Dr. Volker Lipka
Course frequency: each semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 16	

Georg-August-Universität Göttingen **Module M.Bio.126: Structural biochemistry - advanced module II**	12 C 20 WLH

Learning outcome, core skills: Students prove their ability to perform specific biochemical, structure biological and biomolecular techniques independently and their ability to record, interpret and present their experimental results in written form. Acquisation of profound knowledge about current biochemical problems. Handling of state of the art equipment, critical dealing with current biochemical topics, detailed analysis of experiments and their presentation. Independent acquisation of professional knowledge from publications.	**Workload:** Attendance time: 280 h Self-study time: 80 h

Course: Lab course, 7 weeks	20 WLH

Examination: Oral examination (approx. 30 minutes) **Examination prerequisites:** testified protocol in form of a scientific publication (paper) or testified poster about experimental results	12 C

Examination requirements: • detailled knowledge of analytical methods in chromatography, structural biology and biochemistry • ability to utilize these methods in order to answer scientific questions • knowledge about the research topics in the department	

Admission requirements: M.Bio.106 *recommended:* M.Bio.103: Core module "Biochemistry and structural biology"	**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.127: Biochemistry and biophysics - advanced module II**	12 C 20 WLH

Learning outcome, core skills: Students prove their ability to perform specific biochemical, structure biological and biomolecular techniques independently and their ability to record, interpret and present their experimental results in written form. Acquisation of profound knowledge about current biochemical problems. Handling of state of the art equipment, critical dealing with current biochemical topics, detailed analysis of experiments and their presentation. Independent acquisation of professional knowledge from publications.	**Workload:** Attendance time: 280 h Self-study time: 80 h

Course: Lab course, 7 weeks	20 WLH

Examination: Oral examination (approx. 30 minutes) **Examination prerequisites:** testified protocol in form of a scientific publication (paper) or testified poster about experimental results	12 C

Examination requirements: • detailled knowledge of analytical methods in chromatography, structural biology and biochemistry • ability to utilize these methods in order to answer scientific questions • knowledge about the research topics in the department	

Admission requirements: M.Bio.107 *recommended:* M.Bio.103: Core module "Biochemistry and structural biology"	**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: 10	

Georg-August-Universität Göttingen **Module M.Bio.128: Enzyme catalysis and biological chemistry - advanced module II**	12 C 20 WLH

Learning outcome, core skills: Students prove their ability to perform specific biochemical, enzyme cinetical, spectroscopic, thermodynamic and synthetic techniques independently and their ability to record, interpret and present their experimental results in written form. Acquisation of profound knowledge about current emzymebiological and bio(in)organic problems. Handling of state of the art equipment, critical dealing with current enzyme biology/chemistry topics, detailed analysis of experiments and their presentation. Independent acquisation of professional knowledge from publications.	**Workload:** Attendance time: 280 h Self-study time: 80 h

Course: lab rotation II	20 WLH

Examination: Oral examination (approx. 30 minutes) **Examination prerequisites:** testified protocol in form of a scientific presentation ("paper") or testified poster based on results from lab course	12 C

Examination requirements: • detailled knowledge of analytical methods in chromatographic, cinetic, thermodynamic, spectroscopic and synthetic methods • ability to utilize these methods in order to answer scientific questions • knowledge about the research topics in the department	

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.131: Scientific project management - advanced module III**	6 C 5 WLH

Learning outcome, core skills: The students are introduced to project mangement. They learn the tools to communicate scientific contents and to write grant applications.	**Workload:** Attendance time: 70 h Self-study time: 110 h

Course: attendance of colloquia at the GRC (Göttingen Reserach Council) accepted are seminars of invited speakers at colloquia, seminars series or symposia within the Göttingen Research Campus	1 WLH
Course: writing of a proposal for the master project	4 WLH

Examination: research proposal of master project	

Examination: Lecturepresentation of research proposal followed by discussion (approx. 30 minutes) **Examination prerequisites:** participation in at least 14 colloquia at the GRC	

Examination requirements: Students prove their ability to develop a research plan and write a proposal for a research projects.	

Admission requirements: advanced module II (M.Bio.121, M.Bio.122, M.Bio.123 or M.Bio.124)	**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: 48	

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

Learning outcome, core skills: **Learning outcome:** 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. **Core skills:** Knowledge of microorganisms relevant for biotechnology and medicine, ability to identify these organisms and to analyse them with molecular methods.	**Workload:** Attendance time: 42 h Self-study time: 48 h

Course: lecture: General and applied microbiology (Lecture)	3 WLH

Examination: Written examination (90 minutes)	3 C

Examination requirements: detailed knowledge in cell biology, biochemistry and genetics of procaryotic microorgansims	

Admission requirements: can't be combined with core module 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: Advanced knowledge of Molecular Genetics and microbial cell biology through case studies of model systems of molecular mycology (yeasts and filamentous fungi). Acquisation of knowledge up to the "Review" level in one topic.	**Workload:** Attendance time: 42 h Self-study time: 48 h

Course: Molecular genetics and microbial cell biology (Lecture)	3 WLH

Examination: Written examination (120 minutes)	3 C

Examination requirements: detailed knowledge in cell biology, biochemistry and genetics of eucaryotic microorgansims	

Admission requirements: Can´t be combined with Core Module M.Bio.102	**Recommended previous knowledge:** • Watson, Molecular Biology of the Gene, Pearson, 6th Edition • Alberts, Molecular Biology of the Cell, Garland, 5th Edition
Language: English	**Person responsible for module:** Prof. Dr. Gerhard Braus
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: Cellular and molecular biology of plant-microbe interactions**	3 C 3 WLH

Learning outcome, core skills: Introduction into theory and methods for the analysis of plant-microbe interactions on the cell biological and molecular level.	**Workload:** Attendance time: 42 h Self-study time: 48 h

Course: lecture: Plant-microbe-interactions (Lecture)	3 WLH

Examination: Written examination (54 minutes)	

Examination requirements: knowledge of basic concepts in plant-microbe-interactions	

Admission requirements: Can´t be combined with core module M.Bio.104	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Christiane Gatz 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 learn specific analytical techniques commonly used in microbiology, biochemistry and molecular biosciences. This can be the molecular analysis of DNA and whole genomes, the biochemical anlysis of natural products, proteomics or imaging techniques. They learn to select the right method to answer a specific scientific question as well as the handling of the equipment.	**Workload:** Attendance time: 70 h Self-study time: 20 h

Course: Short methods course, varying offers of the faculty Kurzpraktikum aus dem wechselnden Angebot der Fakultät	5 WLH

Examination: testified protocol (max. 20 pages), not graded	3 C

Examination requirements: detailed knowledge of selected methods from current research fields in the departments	

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Dr. rer. nat. Ellen Hornung 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.147: Applied bioinformatics in microbiology**	6 C 8 WLH

Learning outcome, core skills: Students learn to deal with programmes and data bases which enable them to approach questions of modern biology, especially of genomics and system biology. Special emphasis lies on: • application of bioinformatics in molecular phylogeny (analyses on evolution and genome dynamics, metagenomics) • bioinformatical analysis of RNAs (identification of small RNAs and riboswitches, folding of RNA molecules) • motive recognition and gene identification • generation and adaption of models of metabolic pathways	**Workload:** Attendance time: 112 h Self-study time: 68 h

Course: Applied bioinformatics in microbiology (Lecture) concomitant to methods course	2 WLH
Examination: Minutes / Lab report (max. 10 pages), not graded **Examination prerequisites:** regular attendance	6 C

Course: Methods course: Applied bioinformatics in microbiology 3 weeks full-time	6 WLH

Examination requirements: Profound knowledge of bioinformtic tools used for molecular phylogeny, RNA-analysis and motive recognition	

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Rolf Daniel
Course frequency: each winter semester; vorlesungsfreie Zeit	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 12	

Georg-August-Universität Göttingen **Module M.Bio.149: Planning and organization of industry excursions**	3 C 2 WLH

Learning outcome, core skills: Planning and organization of the visitation of companies which recruit microbiologists/ biochemists; this preparation includes (in agreement with supervisor) the choice of the companies to be visited and the preparation and organization of a schedule. The companies should be chosen upon the possibility to gain insight into possible professional fields.	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Preparation of a 3 day excursion (during lecture free time after winter semester; 2 SWS) Preliminary meeting during first lecture of M.Bio.102	2 WLH

Examination: Oral Report (approx. 45 minutes), not graded **Examination prerequisites:** testierter Ablaufplan der Exkursion **Examination requirements:** Students present the chosen companies as well as the schedule of the excursion. Knowledge of the industry relevant for research field	3 C

Admission requirements: Participation in core module M.Bio.102	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** apl. 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: Visitation of companies that recruite microbiologists/biochemists; insight into possible professional fields.	**Workload:** Attendance time: 70 h Self-study time: 20 h

Course: 3 days excursion (during lecture free time after winter semester) *Contents*: Preliminary meeting during first lecture of M.Bio.102 3-day exckursion (lecture free time)	5 WLH

Examination: Minutes / Lab report (max. 20 pages), not graded **Examination prerequisites:** participation in preliminary meetings, preparational seminar and excursions	3 C

Examination requirements: Knowledge of specific companies in the field of microbiology/biochemistry.Team work.	

Admission requirements: Teilnahme Fachmodul M.Bio.102	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** apl. 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: 20	

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: Acquisition of biomolecular, genetic, and biochemical techniques for manipulation and analysis of the model organisms used in the participating departments through experiments from current fields of research, e.g. structural analysis and classification of bacteria, transformation, isolation of DNA, sequencing of DNA, diagnostic and Real-time PCR, fluorescence microscopy, enzyme assays, cloning, protein purification.	**Workload:** Attendance time: 140 h Self-study time: 40 h

Course: Isolation and characterisation of biotechnologically relevant microorganisms (Practical course)	10 WLH

Examination: Minutes / Lab report (max. 10 pages), not graded **Examination prerequisites:** regular attendance	6 C

Examination requirements: Profound knowledge of methods used to analyze procaryotic microorgansims	

Admission requirements: only in combination with M.Bio.101 (methods course 'signaltransduction in bacteria')	**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.152: Methods course: Genetics/Cell biology A**	6 C 10 WLH

Learning outcome, core skills: Research and project orientated acquisition of biomolecular, genetic, biochemical and cell biological techniques in the involved departments in small groups.	**Workload:** Attendance time: 140 h Self-study time: 40 h

Course: Methods course: Genetics/Cell biology A	10 WLH

Examination: Minutes / Lab report (max. 10 pages), not graded **Examination prerequisites:** regelmäßige Teilnahme	6 C

Examination requirements: deepened knowledge of molecular biological, genetic and biochemical techniques to analyze eucaryotes	

Admission requirements: Can only be attended in combination with core module M.Bio.102, where another department/work group has to be selected for the methods course *"Genetics/Cell biology A or B"*.	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Gerhard Braus
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**

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

Learning outcome, core skills: Methods in Structural Biology,structure and function of biological macromolecules. Structure and folding of proteins, structure-function relationships, protein-protein and protein-nucleic acid complexes. Structure-based drug-design	**Workload:** Attendance time: 42 h Self-study time: 48 h

Course: lecture: Structural Biology (Lecture)	3 WLH

Examination: Written examination (90 minutes)	3 C

Examination requirements: The students show that they know the basics of structural biology. They are familiar with biochemical and analytical methods in protein and macromolecular complex- analysis. They have deepened knowledge about selected proteins and protein complexes. The students know the basics in structural resolution and structural characteristics of proteins.	

Admission requirements: can't be combined with M.Bio.105	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Ralf Ficner
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.157: Biochemistry and biophysics**	3 C 3 WLH

Learning outcome, core skills:	**Workload:**
Molecular biochemistry and biophysics of different classes of biomolecules, plant primary and secondary metabolism, lipid metabolism, lipids as signal molecules and secondary metabolites, biotechnological utilization and modification of storage substances, enzymes of lipid metabolism, modern biophysical methods for analysis of biomolecules Handling of state of the art equipment, critical dealing with current biochemical topics, detailed analysis of experiments and their presentation. Independent acquisition of professional knowledge from publications by active participation in the seminar.	Attendance time: 42 h Self-study time: 48 h

Course: lecture: Biochemistry and Biophysics (Lecture)	3 WLH

Examination: Written examination (90 minutes)	3 C

Examination requirements:	
• basic knowledge of different classes of biomolecules and their metabolism • knowledge about spectroscopy of molecules • biotechnologic techniques using plants	

Admission requirements: can't be combined with M.Bio.106	**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:	**Workload:**
Catalytic mechanisms of enzymes, mechanisms of macromolecular complexes, biocatalysis, kinetics und thermodynamics of biochemical reactions, chemical model systems of enzymes, synthesis of biooligomers, synthesis of ligands, ligation techniques, array technologies	Attendance time: 42 h Self-study time: 48 h

Course: lecture: Enzyme Catalysis and Chemical Biology (Lecture)	3 WLH

Examination: Written examination (90 minutes)	3 C

Examination requirements:

- knowledge about kinetics and thermodynamics of biochemical reactions
- knowledge about different organic synthesis mechanisms
- knowledge about catalytic mechanisms of enzyme

Admission requirements: can't be combined with M.Bio.107	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Kai Tittmann
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.160: Organisation of a local iGEM team**	6 C 7 WLH

Learning outcome, core skills: The students organize all aspects of the iGEM project. They learn how to • set up an iGEM team • define a project • acquire sponsoring • organize “human practice measures” • relate to legal authorities and the faculty	**Workload:** Attendance time: 98 h Self-study time: 82 h

Examination: Term Paper (max. 20 pages), not graded **Examination prerequisites:** regular attendance and participation **Examination requirements:** Erstellen einer Präsentationsmappe zur Einwerbung von Sponsorengeldern	6 C

Examination requirements: Self-dependent organization of a scientific project from project definition to execution and motivation of coworkers	

Admission requirements: At least one of the core modules has to be finished.	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Jörg Stülke
Course frequency: each summer semester; Januar bis Oktober	**Duration:**
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 6	

Georg-August-Universität Göttingen **Module M.Bio.161: methods course: Signal transduction in bacteria**	6 C 10 WLH

Learning outcome, core skills: Acquisition of biomolecular, genetic, and biochemical techniques for manipulation and analysis of the model organisms used in the participating departments through experiments from current fields of research, e.g. structural analysis and classification of bacteria, transformation, isolation of DNA, sequencing of DNA, diagnostic and Real-time PCR, fluorescence microscopy, enzyme assays, cloning, protein purification.	**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 attendance	6 C

Examination requirements: deepened knowledge of molecular biological, genetic and biochemical techniques to analyze procaryotes	

Admission requirements: only in combination with M.Bio.101 (methods course '*Isolation and characerization of biotechnological relevant bacteria)*.	**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: Genetics/Cell biology B**	6 C 10 WLH

Learning outcome, core skills: Research and project orientated acquisition of biomolecular, genetic, biochemical and cell biological techniques in the involved departments in small groups.	**Workload:** Attendance time: 140 h Self-study time: 40 h

Course: Methods course: Genetics/Cell biology B	10 WLH

Examination: Minutes / Lab report (max. 10 pages), not graded **Examination prerequisites:** regelmäßige Teilnahme	6 C

Examination requirements: deepened knowledge of molecular biological, genetic and biochemical techniques to analyze eucaryotes	

Admission requirements: Can only be attended in combination with core module M.Bio.102, where another department/work group has to be selected for the methods course *"Genetics/Cell biology A or B"*.	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Gerhard Braus
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: Methods in Structural Biochemistry, structure and function of biological macromolecules. Structure and folding of proteins, structure-function relationships, protein-protein and protein-nucleic acid complexes. Handling of state of the art equipment, critical dealing with current biochemical topics, detailed analysis of experiments and their presentation.	**Workload:** Attendance time: 140 h Self-study time: 40 h

Course: Structural biochemistry (Practical course) *Contents*: Präparation rekombinanter Proteine mittels Affinitäts-, Ionenaustauscher und Gelfiltrations-Chromatografie sowie Ultrazentrifugation, Charakterisierung rekombinanter Proteine und makromolekularer Komplexe (Gelelektrophorese, spektroskopische Methoden), biochemische Analyse von Protein-RNA Komplexen, Kristallisation von Proteinen. Strukturaufklärung biologischer Makromoleküle mittels Röntgenkristallografie und Cryo-Elektronen mikroskopie. Studien zur Dynamik und Funktion makromolekularer Maschinen.	10 WLH

Examination: Minutes / Lab report (max. 10 pages), not graded **Examination prerequisites:** regular attendance	6 C

Examination requirements: knowledge of the methods covered in the course	

Admission requirements: M.Bio.107, M.Bio.108 or M.Bio.156 can't be combined with M.Bio.106	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Ralf Ficner
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.167: Methods course: biochemistry and biophysics**	6 C 10 WLH

Learning outcome, core skills: Molecular biochemistry and biophysics of different classes of biomolecules, modern biophysical methods for analysis of biomolecules Handling of state of the art equipment, critical dealing with current biochemical topics, detailed analysis of experiments and their presentation	**Workload:** Attendance time: 140 h Self-study time: 40 h

Course: Methodenpraktikum: Biochemie und Biophysik *Contents*: Biochemical analysis of carbohydrates, lipids, proteins and nucleic acids using photometric assays, electrophoresis, thin layer chromatography as well as fully automated analysis tools (HPLC/GC/GCMS). Spectroscopy of biomolecules (fluorescence, FT-IR, CD, UV/Vis), modern microscopy techniques (optical microscopy, scanning probe techniques), functional analysis of different membrane protein classes	10 WLH

Examination: Minutes / Lab report (max. 20 pages) **Examination prerequisites:** regelmäßige Teilnahme am Praktikum und rechtzeitige Abgabe der Protokolle	6 C

Examination requirements: Knowledge of the methods covered in the course	

Admission requirements: M.Bio.106, M.Bio.108 or M.Bio.157 can't 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: Catalytic mechanisms of enzymes, mechanisms of macromolecular complexes, biocatalysis, kinetics und thermodynamics of biochemical reactions, synthesis of biooligomers, synthesis of ligands, ligation techniques, array technologies Handling of state of the art equipment, detailed analysis of experiments and their presentation.	**Workload:** Attendance time: 140 h Self-study time: 40 h

Course: methods course: Enzyme catalysis and chemical biology (Practical course) *Contents*: recombinant expression of enzymes and purification by chromatographic methods (gel filtration, affinity and ion exchange chromatography), kinetic characterisation of enzymatic reactions by steady-state assays and transient kinetics (stopped-flow, quench-flow), thermodynamic characterisation of enzyme : inhibitor or enzyme : substrate interactions by spectroscopic methods (circular dichroism, fluorescence spectroscopy, UV-Vis spectroscopy, NMR spectroscopy) as well as microcalorimetric methods (ITC), chemical synthesis of biooligomers and of ligands, synthesis of organic and inorganic (metallo-)complexes	10 WLH

Examination: Minutes / Lab report (max. 10 pages) **Examination prerequisites:** regular attendance	6 C

Examination requirements: Knowledge of the methods and techniques covered by the course	

Admission requirements: M.Bio.106 or M.Bio.107 can't be combined with key competence module M.Bio.157	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Kai Tittmann
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 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.Che.3907: Introduction into Synchrotron- and Neutron Scattering**	3 C 3 WLH

Learning outcome, core skills: Nach erfolgreichem Abschluss dieses Moduls haben die Studierenden die wichtigsten experimentellen Methoden der Synchrotron- und Neutronenstreuung sowie deren Anwendungsgebiete im Bereich der kondensierten Materie kennengelernt. Darüber hinaus beherrschen sie die Grundlagen der Streutheorie. Anhand von aktuellen Forschungsergebnissen können sie die Leistungsfähigkeit der Methoden beurteilen und haben einen Einblick in die Forschung mit Großgeräten erhalten.	**Workload:** Attendance time: 42 h Self-study time: 48 h

Course: Vorlesung " Einführung in die Synchrotron- und Neutronenstreuung" (Lecture)	2 WLH
Course: Seminar zur Vorlesung	1 WLH

Examination: Referat (ca. 20 Min.) mit anschließender Diskussion (ca. 10 Min.)	3 C

Examination requirements: Fundierte Kenntnisse unterschiedlicher Streumethoden mit den zugehörigen theoretischen Grundlagen. Kompetente Darstellung einer aktuellen Forschungsarbeit, Diskussionskompetenz	

Admission requirements: none	**Recommended previous knowledge:** none
Language: German	**Person responsible for module:** Prof. Dr. Götz Eckold
Course frequency: je nach Semesterlage	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** 1 - 3
Maximum number of students: 40	