Julius-Maximilians-
UNIVERSITÄT
WÜRZBURG

Module Catalogue

for the Subject

Biochemistry

as a Master's with 1 major

with the degree "Master of Science"

(120 ECTS credits)

Examination regulations version: 2026
Responsible: Faculty of Medicine
Responsible: Faculty of Chemistry and Pharmacy

Contents

Final Colloquium 182

The subject is divided into

Learning Outcomes

German contents and learning outcome available but not translated yet.

Wissenschaftliche Befähigung

- Nach erfolgreichem Abschluss des Master-Studiums verfügen die AbsolventInnen über vertiefte Kenntnisse des wissenschaftlichen Arbeitens in der Forschung und Anwendung der Biochemie und ihrer inhaltlichen Grundlagen. Sie haben sich dabei auf einen der beiden angebotenen Schwerpunkte „Molekulare Lebenswissenschaften" oder „Molekulare Onkologie" spezialisiert, indem sie die diesen Schwerpunkten zugeordneten Module (Vorlesungen, Kurspraktika und Seminare) absolviert haben. Sie besitzen neben den vertieften fachspezifischen Kenntnissen auch Abstraktionsvermögen, analytisches Denken, Problemlösungskompetenz und die Fähigkeit, komplexe Zusammenhänge zu strukturieren. Die Grundlagen hierfür werden in den o.g. Veranstaltungen vermittelt und mittels Klausuren, Kolloquien, Protokollen oder Referaten überprüft.
- Die AbsolventInnen besitzen nach Erlangung des Masters die Kompetenzen, ein gegebenes wissenschaftliches Problem planvoll und nach den Regeln der guten wissenschaftlichen Praxis zu bearbeiten, darunter unter anderem sich unter Zuhilfenahme der Kenntnisse in der Literaturrecherche in neue Aufgabengebiete einzuarbeiten und Veröffentlichungen in internationalen Journalen im Kontext der wissenschaftlichen Literatur kritisch einzuordnen und zu bewerten. Sie sind in der Lage, das erworbene Wissen selbständig anzuwenden und auf neue Aufgabenstellungen zu übertragen, Experimente auf Grundlage biochemischer Methoden strukturiert und in vorgegebenem zeitlichem Rahmen durchzuführen und zu dokumentieren, die ermittelten Daten kritisch zu analysieren und die Ergebnisse schriftlich zusammenzufassen. Außerdem können Sie ihre selbständig durchgeführten Projekte vor einem Publikum darstellen und die gewählte Methodik in fachlicher Diskussion verteidigen. Vermittelt werden diese Fähigkeiten im Rahmen von Labor-Praktika im dritten Fachsemester und der Master-Arbeit. Die Überprüfung der Zielerreichung findet durch die Erstellung von Praktikums-Protokollen und nicht zuletzt der Master-Thesis und deren Präsentation mit anschließender Diskussion im Abschluss-Kolloquium statt.

Befähigung zur Aufnahme einer Erwerbstätigkeit

- Die AbsolventInnen besitzen Abstraktionsvermögen, Problemlösungskompetenz und die Fähigkeit, komplexe Zusammenhänge in analytischer Herangehensweise zu strukturieren. Die Grundlagen hierfür werden in Vorlesungen, Seminaren und Kurspraktika der verschiedenen Disziplinen der Lebenswissenschaften vermittelt und mittels Klausuren, Kolloquien, Referaten oder Protokollen überprüft.
- Die AbsolventInnen sind auch in der Lage, ihr theoretisches Wissen in der Praxis anzuwenden und können mit den erlernten wissenschaftlichen Methoden auch unbekannte Probleme aus unterschiedlichen fachlichen Perspektiven analysieren und bearbeiten. Sie sind es dabei gewohnt, in einem Team aus KommilitonInnen, KollegInnen und/oder WissenschaftlerInnen konstruktiv und zielorientiert zusammenzuarbeiten. Der Praxisbezug ist durch einen hohen Anteil an Laborpraktika sowohl als Kurspraktika, individuelle Forschungspraktika und nicht zuletzt der Master-Arbeit gegeben, deren erfolgreiche Absolvierung durch Protokolle bzw. die Master-Thesis überprüft wird.
- Als interdisziplinärer und internationaler Studiengang, dessen Veranstaltungen in der Regel in englischer Sprache unterrichtet werden, fördert der Master-Studiengang Biochemie von Beginn an fachübergreifendes Lernen, Denken und Verstehen, sowie durch tägliche Übung auch die Kommunikations-Kompetenz in Englisch, der international anerkannten Wissenschafts-Sprache. Diese auf dem breiten Fundament der im Bachelor Biochemie erworbenen Kompetenzen aufbauende, vertiefte und spezialisierte Wissensbasis und Methodenkompetenz, sowie die ein-

geübte Teamfähigkeit und Weltoffenheit können die AbsolventInnen gewinnbringend in ihrer Berufspraxis einsetzen.

Persönlichkeitsentwicklung

- Die AbsolventInnen sind bereit und in der Lage, Verantwortung für ihr Handeln und für andere zu übernehmen. Sie verfügen über die kommunikativen Fähigkeiten, komplexe Sachverhalte und Standpunkte im Team zu entwickeln, zielgruppengerecht darzustellen und reflektiert gegenüber abweichenden Positionen zu verteidigen und weiterzuentwickeln. Diese Fähigkeiten zur Übernahme von Verantwortung, Diskussionsbereitschaft und Teamfähigkeit sowie Eigenverantwortung und Selbständigkeit erlernen und beweisen die Studierenden in erster Linie durch die Anfertigung von Praktikums-Protokollen und der Abschlussarbeit, deren Zielerreichung mit der Bewertung der Arbeiten überprüft wird.
- Das Curriculum des Masters Biochemie ermöglicht den Studierenden, ein Erasmus-Studium oder ein Laborpraktikum an einer ausländischen Universität durchzuführen. Der Prüfungsausschuss Biochemie wacht dabei über die Einhaltung der wissenschaftlichen Standards und ein adäquates Projekt. Die Studierenden können dadurch wertvolle persönliche Erfahrungen erwerben und ihren sprachlichen und kulturellen Horizont öffnen.
- Erst die durch Einübung und Ermutigung erlangte Fähigkeit zur Kritik und Reflexion (inklusive Selbstreflexion und Selbstkritik) ermöglicht eigenständiges Denken und selbstbestimmtes Handeln, das vor sich selbst und anderen begründet ist und rational kommuniziert werden kann. Diese Kritikfähigkeit und Fähigkeit zur Selbstreflexion erlernen die Studierenden mittels Feedbacks durch Lehrende und Studierende zu ihrem Vortrag in Seminaren, die vermehrt im Masterstudium stattfinden.

Gesellschaftliches Engagement

- AbsolventInnen des Masters Biochemie werden durch ihr Studium in die Lage versetzt, zu gesellschaftlich kritisch und kontrovers diskutierten Fragen, die Themen der molekularen Biowissenschaften betreffen, wissenschaftlich fundiert begründete Position zu beziehen. Sie sind sich darüber hinaus bei ihrer Arbeit immer ihrer ethischen Verantwortung gegenüber der Gesellschaft und der Umwelt bewusst und reflektieren ihr Handeln diesbezüglich stets kritisch. Vor allem im Rahmen der individuellen, mehrwöchigen bis ganzsemestrigen Laborpraktika und der Abschlussarbeit setzen sich die Studierenden mit aktuellen Forschungsthemen selbständig und kritisch auseinander. Hierzu gehört auch die Reflexion möglicher Folgen der eigenen Arbeit für Umwelt und Gesellschaft und der daraus resultierenden ethischen Fragestellungen. Die Zielerreichung wird durch das erfolgreiche Bestehen der Praktikums-Protokolle und der Abschlussarbeit überprüft.

Abbreviations used

Course types: **E** = field trip, **K** = colloquium, **O** = conversatorium, **P** = placement/lab course, **R** = project, **S** = seminar, **T** = tutorial, **Ü** = exercise, **V** = lecture

Term: **SS** = summer semester, **WS** = winter semester

Methods of grading: **NUM** = numerical grade, **B/NB** = (not) successfully completed

Regulations: **(L)ASPO** = general academic and examination regulations (for teaching-degree programmes), **FSB** = subject-specific provisions, **SFB** = list of modules

Other: **A** = thesis, **LV** = course(s), **PL** = assessment(s), **TN** = participants, **VL** = prerequisite(s)

Conventions

Unless otherwise stated, courses and assessments will be held in German, assessments will be offered every semester and modules are not creditable for bonus.

Notes

Should there be the option to choose between several methods of assessment, the lecturer will agree with the module coordinator on the method of assessment to be used in the current semester by two weeks after the start of the course at the latest and will communicate this in the customary manner.

Should the module comprise more than one graded assessment, all assessments will be equally weighted, unless otherwise stated below.

Should the assessment comprise several individual assessments, successful completion of the module will require successful completion of all individual assessments.

In accordance with

the general regulations governing the degree subject described in this module catalogue:

ASPO2015

associated official publications (FSB (subject-specific provisions)/SFB (list of modules)):

??-???-2026 (2026-??)

This module handbook seeks to render, as accurately as possible, the data that is of statutory relevance according to the examination regulations of the degree subject. However, only the FSB (subject-specific provisions) and SFB (list of modules) in their officially published versions shall be legally binding. In the case of doubt, the provisions on, in particular, module assessments specified in the FSB/SFB shall prevail.

Compulsory Electives 1

(50 ECTS credits)

Choosing a focus area; this must be fully completed.

Focus - Molecular Life-Sciences

(50 ECTS credits)

Subfield - Structural and Functional Biochemistry

(30 ECTS credits)

Module title			Abbreviation
RNA worlds			08-MBC-RNAW-152-m01
Module coordinator		**Module offered by**	
holder of the Chair of Biochemistry		Chair of Biochemistry	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
5	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

This module comprises a lecture and a seminar. It provides a detailed and in-depth exploration of the current state of research on RNA-protein complexes, their structures and functions as well as the theoretical principles of cutting-edge RNA-based research methods.

Intended learning outcomes

Students have become familiar with the topics discussed in the module and are able to transfer what they have learned to new problems. They are able to situate new research findings within the context of existing knowledge as well as to determine the significance of those findings.

Courses (type, number of weekly contact hours, language — if other than German)

V (1) + S (1)
Module taught in: German or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (30 to 60 minutes) or
b) log (approx. 10 to 20 pages) or
c) oral examination of one candidate each (30 to 60 minutes) or
d) oral examination in groups of up to 3 candidates (approx. 30 to 60 minutes) or
e) presentation (20 to 45 minutes)
Students will be informed about the method, length and scope of the assessment prior to the course.
Language of assessment: German and/or English

Allocation of places

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Additional information

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Workload

150 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Life cycle of proteins			08-MBC-LCP-152-m01
Module coordinator		**Module offered by**	
holder of the Chair of Biochemistry		Chair of Biochemistry	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
5	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

This module comprises a lecture and a seminar. It provides a detailed and in-depth exploration of the current state of research on the regulation and control of the entire life cycle of proteins.

Intended learning outcomes

Students have become familiar with the topics discussed in the module and are able to transfer what they have learned to new problems. They are able to situate new research findings within the context of existing knowledge as well as to determine the significance of those findings.

Courses (type, number of weekly contact hours, language — if other than German)

V (1) + S (1)
Module taught in: German or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (30 to 60 minutes) or
b) log (approx. 10 to 20 pages) or
c) oral examination of one candidate each (30 to 60 minutes) or
d) oral examination in groups of up to 3 candidates (approx. 30 to 60 minutes) or
e) presentation (20 to 45 minutes)
Students will be informed about the method, length and scope of the assessment prior to the course.
Language of assessment: German and/or English

Allocation of places

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Additional information

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Workload

150 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Structure and function of RNA-protein complexes			08-MBC-RNP-152-m01
Module coordinator		**Module offered by**	
holder of the Chair of Biochemistry		Chair of Biochemistry	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
10	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

Performing practical experiments, students will actively engage with scientific methods and lab techniques for the investigation of RNA-protein complexes.

Intended learning outcomes

Students master the techniques used in the practical course. They are able to explain and critically reflect upon the experiments they have performed as well as to present and discuss their findings in a written report.

Courses (type, number of weekly contact hours, language — if other than German)

Ü (6)
Module taught in: German or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) log (20 to 30 pages) or
b) oral examination of one candidate each (20 to 30 minutes) or
c) oral examination in groups of up to 3 candidates (15 to 30 minutes per candidate) or
d) presentation (20 to 40 minutes)
Language of assessment: German and/or English
Assessment offered: Once a year, winter semester

Allocation of places

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Additional information

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Workload

300 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Protein quality control			08-MBC-PQK-152-m01
Module coordinator		**Module offered by**	
holder of the Chair of Biochemistry		Chair of Biochemistry	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
10	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

Performing practical experiments, students will actively engage with scientific methods and lab techniques in the field of protein degradation in eukaryotes.

Intended learning outcomes

Students master the techniques used in the practical course. They are able to explain and critically reflect upon the experiments they have performed as well as to present and discuss their findings in a written report.

Courses (type, number of weekly contact hours, language — if other than German)

Ü (6)
Module taught in: German or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) log (20 to 30 pages) or
b) oral examination of one candidate each (20 to 30 minutes) or
c) oral examination in groups of up to 3 candidates (15 to 30 minutes per candidate) or
d) presentation (20 to 40 minutes)
Language of assessment: German and/or English
Assessment offered: Once a year, summer semester

Allocation of places

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Additional information

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Workload

300 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title	Abbreviation
Macromolecular Crystallography	08-MBC-MK-152-m01

Module coordinator	Module offered by
holder of the Chair of Biochemistry	Chair of Biochemistry

ECTS	Method of grading	Only after succ. compl. of module(s)
10	numerical grade	--

Duration	Module level	Other prerequisites
1 semester	graduate	--

Contents

This module comprises a lecture, exercises and a lab course. The lecture will discuss the following topics: biophysical characterisation of protein samples prior to crystallisation; manual and high-throughput methods for protein crystallisation; X-ray generators and synchrotrons, properties of X-rays; data collection using different detector systems; symmetry properties of molecules, point groups and space groups; the phase problem and solution of that problem using multiple isomorphous replacement, anomalous diffraction and molecular replacement; improvement of experimental phases by solvent flattening and molecular averaging; manual and automated model building; refinement procedures and analysis of the experimentally determined structures. The exercises will give students the opportunity to explore the topics discussed in the lecture in more depth. In the lab course, students will carry out all of the steps involved in protein structure analysis that were discussed in the lecture. They will use lysozyme as an example enzyme and will carry out the following steps autonomously: crystallisation of the purified protein, data collection on the Institute's diffractometer, solution of the phase problem using the anomalous signal from intrinsic sulphur atoms, model building, structure refinement, analysis of the refined structure.

Intended learning outcomes

Students will develop a thorough knowledge of modern macromolecular crystallographic methods. The lecture will provide an in-depth exploration of those methods, the exercise will give students the opportunity to engage with the most intellectually challenging aspects in more detail, and the lab course will give them practice in using the methods. At the end of the module, students will be able to perform crystallographic structure analyses for their Master's or doctoral thesis.

Courses (type, number of weekly contact hours, language — if other than German)

V (2) + Ü (1) + P (5)
Module taught in: German or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (approx. 45 to 90 minutes) or
b) log (20 to 30 pages) or
c) oral examination of one candidate each (20 to 30 minutes) or
d) oral examination in groups of up to 3 candidates (15 to 30 minutes per candidate) or
e) presentation (20 to 40 minutes)
Language of assessment: German and/or English
Assessment offered: Once a year, summer semester

Allocation of places

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Additional information

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Workload

300 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)
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Module title	Abbreviation
Mass-Spectrometry and Proteomics	08-MBC-MSP-161-m01

Module coordinator	Module offered by
holder of the Chair of Biochemistry	Chair of Biochemistry

ECTS	Method of grading	Only after succ. compl. of module(s)
5	numerical grade	--

Duration	Module level	Other prerequisites
1 semester	graduate	--

Contents

This module comprises a lecture, a seminar and a lab course. The lecture discusses the fundamental principles of the mass spectrometry of biomolecules. Topics to be covered in the lecture include ESI and MALDI ionisation techniques as well as the operating principles of TOF, Orbitrap and other mass analysers. The lecture also provides an introduction to CID and ETD fragmentation techniques, peptide and protein separation methods as well as the analysis of mass spectrometric data (protein databases, FDR, GO terms, etc.). It gives an overview of quantitative proteomics with a special focus on different stable isotope quantification methods (e.g. SILAC, N15 labelling, iTRAQ) and provides an insight into the mass spectrometric analysis of post-translational modifications. The seminar covers the fundamental principles of the analysis of mass spectrometric data. It introduces students to different software packages and gives them the opportunity to independently develop solutions to a range of problems. In the lab course, students will use affinity purification to isolate a protein complex from yeast. They will then use 1D-SDS-PAGE to separate that complex and will proteolytically cleave it in the gel. Afterwards, students will use nano-LC-MS/MS to analyse the peptides thus obtained and will conduct a data analysis to identify specific interaction partners and post-translational modifications.

Intended learning outcomes

Students have learned the theoretical foundations of mass spectrometry protein and proteomic analysis. They have learned how to use proteomic data analysis software tools. Students have become proficient in the affinity purification of protein complexes and have learned the steps involved in the preparation of samples for mass spectrometry protein analysis, e.g. SDS-PAGE and in-gel digestion. They have gained an insight into how to operate a nanoHPLC-coupled mass spectrometer.

Courses (type, number of weekly contact hours, language — if other than German)

V (2) + S (1) + P (2)
Module taught in: German or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (approx. 45 to 90 minutes) or
b) log (20 to 30 pages) or
c) oral examination of one candidate each (20 to 30 minutes) or
d) oral examination in groups of up to 3 candidates (15 to 30 minutes per candidate) or
e) presentation (20 to 40 minutes)
Language of assessment: German and/or English
Assessment offered: Once a year, winter semester

Allocation of places

67 places.

Additional information

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Workload

150 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)
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Module title			Abbreviation
Modern Drug Research 1: Basics and Drug Design			08-MCM3-242-m01
Module coordinator		**Module offered by**	
lecturers of Pharmaceutical Chemistry		Institute of Pharmacy and Food Chemistry	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
5	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

Fundamentals: Phases of drug development, principles of drug action, pharmacokinetics and biotransformation; strategies of drug discovery, drug targets, chemical space of drug discovery, protein-ligand interactions, structure-activity-relationships (SAR), bioisosterism, prodrug strategies.
Experimental methods: binding assays, enzymatic assays, biophysical methods, high-throughput-screening (HTS).
Theoretical methods and drug design: virtual screening, ligand-based methods, QSAR, pharmacophore models, structure-based drug design, docking, simulation methods, machine learning (AI).
Case studies (drug discovery, design and optimization)

Intended learning outcomes

The students master the fundamentals of drug development, the strategies of drug discovery and the applied theoretical and experimental methods. They can understand and critically question the essential content of current scientifc publications in drug research. They are able to carry out a basic virtual screen and to evaluate its results.

Courses (type, number of weekly contact hours, language — if other than German)

S (2) + Ü (1)
Module taught in: German or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) presentation (approx. 30 minutes) or
b) written examination (approx. 45 to 90 minutes)
Language of assessment: German and/or English

Allocation of places

22 places.
16 places for students of the Master's degree programme Chemie (Chemistry): Places will be allocated according to the same number of subject semesters; students who have chosen Medizinische Chemie (Medicinal Chemistry) as their focus will be given preferential consideration.
6 places for students of the Master's degree programme Biochemie (Biochemistry): Places will be allocated according to the number of subject semesters; among applicants with the same number of subject semesters, places will be allocated by lot.
2 places for students of the Master's degree programme MINT-Lehramt PLUS: Places will be allocated according to the number of subject semesters; among applicants with the same number of subject semesters, places will be allocated by lot ; a waiting list will be maintained and places re-allocated by lot as they become available.

Additional information

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Workload

150 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)
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Module title			Abbreviation
Modern Drug Research 2: Technologies - Targets - Modalities			08-MCM4-242-m01
Module coordinator		**Module offered by**	
lecturers of Pharmaceutical Chemistry		Institute of Pharmacy and Food Chemistry	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
5	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

1. DNA-encoded library technology for small molecule screening.
2. Phage display and chemical modification of peptides in display libraries.
3. Medicinal Chemistry in the Pharmaceutical Industry, case studies presented by invited external speakers.
4. Entrepreneurship in the life sciences: start-ups, biotech, and private equity.
5. Protein-protein interactions as drug targets and modalities to inhibit them.
6. How not to perform the art of Medicinal Chemistry: Dirty Drugs, PAINS, frequent hitters, and impurities from compound synthesis as confounders
7. Therapeutic nucleic acid drugs
8. Multi-target drugs
9. Pharmacokinetic aspects in drug development
10Modern strategies in drug delivery

Intended learning outcomes

The students acquire basic knowledge of the terminology of medicinal chemistry, technologies for drug identification; exemplary biologics (oligonucleotides, peptides), properties of protein-protein-interaction inhibitors, basic knowledge of the industrial pharmaceutical research process, including entrepreneurship aspects, as well as of the compound optimization cycles and can confidently apply this knowledge in solving Medicinal Chemistry-related tasks.

By successfully completing this module, students will be able to,

- explain the processes of pharmaceutical research and applications in industry.
- understand the underlying principles for the action of biological drugs.
- understand different technologies for drug identification.
- understand pharmacokinetic challenges to drug development.
- understand modern technologies for drug delivery.
- describe different strategies for protein-protein interaction inhibition and to draw conclusions about possible consequences of protein-protein interaction inhibition from chemical structural features.
- to develop interdisciplinary solution strategies for practical problems at the interface between chemistry, pharmacology and biophysics for basic research and biomedical applications.

Courses (type, number of weekly contact hours, language — if other than German)

S (2)
Module taught in: German or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (approx. 45 to 90 minutes) or
b) oral examination of one candidate each (20 to 30 minutes)
Language of assessment: German and/or English

Allocation of places

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Additional information

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Workload
150 h
Teaching cycle
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Referred to in LPO I (examination regulations for teaching-degree programmes)
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Module title	Abbreviation
Biophysics of Proteins	03-MBC-PBP-172-m01

Module coordinator	Module offered by
Chair of Rudolf Virchow Center for Experimental Biomedicine	Faculty of Medicine

ECTS	Method of grading	Only after succ. compl. of module(s)
5	numerical grade	--

Duration	Module level	Other prerequisites
1 semester	graduate	--

Contents

The module "Protein Biophysics" will provide participants with detailed insights into the biophysical characterization of proteins. We will deal both with soluble model proteins (Dr. Sonja Lorenz) and with the particular challenges of membrane protein research (Dr. Sebastian Geibel). The module contains a lecture part that deals with the basics of different biophysical methods to characterize protein stability, oligomerization behavior and shape. Among others, small angle X-ray scattering (SAXS), circular dichroism (CD) spectroscopy, fluorimetry (DSC) and light scattering (DLS + MALS) are discussed. The lectures will be complemented by short presentations on selected topics. In the practical part of the course, the techniques discussed will be applied using self-isolated proteins, data will be analysed with computer support and interpreted scientifically.

Intended learning outcomes

The participants get an overview of the manifold biophysical methods for characterizing proteins and the particularities of working with membrane proteins. The acquired knowledge ranges from the theoretical basics of the methods to their practical application to the scientific analysis and interpretation of the data and should give a realistic impression of the researcher's life.

Courses (type, number of weekly contact hours, language — if other than German)

V (2) + S (1) + P (2)
Module taught in: English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (approx. 45 to 90 minutes) or
b) log (20 to 30 pages) or
c) oral examination of one candidate each (20 to 30 minutes) or
d) oral examination in groups of up to 3 candidates (15 to 30 minutes per candidate) or
e) presentation (20 to 40 minutes)
Language of assessment: German and/or English

Allocation of places

Biochemie (Biochemistry) Master's: 63 places.

Additional information

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Workload

150 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title	Abbreviation
Electron microscopy and image processing in structural biology	08-MBC-EMV-172-m01

Module coordinator	Module offered by
holder of the Chair of Biochemistry	Chair of Biochemistry

ECTS	Method of grading	Only after succ. compl. of module(s)
5	numerical grade	--

Duration	Module level	Other prerequisites
1 semester	graduate	--

Contents

The module "Electron Microscopy and Image Processing in Structural Biology" contains a lecture part which explains the basics of electron microscopy and image processing. First, the components of the electron microscope, beam path, image formation and contrast transmission are explained. Subsequently, different methods of sample preparation for electron microscopy in structural biology will be discussed as well as strategies for instrument alignment and data acquisition. The second part of the lecture concentrates on the processing of image data. The focus is on the principles of single image analysis. This includes the alignment of image data, their classification and three-dimensional image reconstruction. DeNovo and iterative methods of 3D image reconstruction are discussed. The learned principles are then applied to the special cases of 2D crystal analysis and tomography. Finally, micro electron diffraction is presented as an alternative to X-ray structure analysis. In the seminar part of the module some aspects of the lecture are deepened on the basis of case studies from the literature. The students will read these case studies in advance. In this work they are guided through a catalogue of questions. Some of the questions will be addressed independently in a written homework in advance. Most case studies will be presented by one student each. All case studies will be explained in a discussion. The participants develop a critical understanding of the advantages and limitations of the method. Some selected topics will be further deepened by arithmetic exercises.

Intended learning outcomes

The participants will learn the theoretical basics of electron microscopy and image processing in structural biology on a broad basis. They will get an overview of key strategies of the method, which are essential for structure elucidation. These can be applied and deepened in a practical course. In the end, all participants will be able to understand, communicate and critically evaluate primary literature on this method.

Courses (type, number of weekly contact hours, language — if other than German)

V (1) + S (1)
Module taught in: German or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (approx. 45 to 90 minutes) or
b) log (20 to 30 pages) or
c) oral examination of one candidate each (20 to 30 minutes) or
d) oral examination in groups of up to 3 candidates (15 to 30 minutes per candidate) or
e) presentation (20 to 40 minutes)
Language of assessment: German and/or English

Allocation of places

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Additional information

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Workload

150 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)
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Module title			Abbreviation
Practical course of electron microscopy and image processing			08-MBC-EMP-172-m01
Module coordinator		**Module offered by**	
holder of the Chair of Biochemistry		Chair of Biochemistry	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
10	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

The module "Practical Course Electron Microscopy and Single Image Processing" consists of an electron microscopy part and an image processing part. In the electron microscopy part the participants get to know the different elements of the electron microscope and how they work. Aspects of alignment, focusing and data acquisition will be developed. The participants will then use different preparation methods for electron microscopy (grid preparation, negative contrast and vitrification). The samples are then imaged in an electron microscope. Sample and data optimization are developed and data sets are created for further image processing. In the image processing part, the participants are first introduced to general aspects of computer operation under Linux (basic Linux commands, basic shell scripting). On this basis, the participants determine the structure of a protein complex from a real test data set. They learn step by step how to select good images, how to correct data for image-dependent aberrations and how to normalize, mask and filter image data. With the data prepared in this way, the participants will determine the characteristic views of the complex (2D classification) and combine these with various methods to form a DeNovo model. This model is then refined in an iterative process. In the second part of the image processing practical course the participants apply what they have learned to their own data. At the end of the practical course the participants present the different working steps and exchange experiences. The practical part of the electron microscopy practical course and the image processing practical course on test data will be summarized in a protocol. The results on the own data are presented in the form of a scientific publication, which requires a corresponding literature work and the creation of more complex images.

Intended learning outcomes

The participants will be taught the skills to prepare an already purified biological complex for structure determination with the help of electron microscopy and to independently determine its structure de novo from electron microscopic data. The participants will acquire a practical understanding for the data acquisition at the electron microscope and will be able to plan and carry out a corresponding experiment with technical support in the future. The participants will further develop the following key qualifications in the course: Computer skills (insights into Linux), team skills (working in teams of 2-3 students with varying composition), communication skills (oral and written presentation of results).

Courses (type, number of weekly contact hours, language — if other than German)

P (8)
Module taught in: German or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) log (20 to 30 pages) or
b) oral examination of one candidate each (20 to 30 minutes) or
c) oral examination in groups of up to 3 candidates (15 to 30 minutes per candidate) or
d) presentation (20 to 40 minutes)
Language of assessment: German and/or English
Assessment offered: Once a year, summer semester

Allocation of places

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Additional information

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Workload
300 h
Teaching cycle
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Referred to in LPO I (examination regulations for teaching-degree programmes)
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Module title			Abbreviation
Functional Proteomics: Deciphering Protein Worlds			08-MBC-FPV-232-m01
Module coordinator		**Module offered by**	
holder of the Chair of Biochemistry II		Chair of Biochemistry	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
5	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

The module provides in lecture and seminar the current state of the art in the field of functional proteomics as well as the theoretical basis of state-of-the-art methods of biomolecular mass spectrometry for the study of organization, dynamics and modulation of the proteome of eukaryotic cells. Emphasis is placed on quantitative strategies for the functional analysis of metabolic cell organelles, protein machines, and signaling and proteostasis networks.

Intended learning outcomes

After participation in the module events, the students are familiar with the contents taught. They can explain advantages and disadvantages of protein mass spectrometry methods, know a wide range of applications of the key methods and can use them to address new biological questions.

Courses (type, number of weekly contact hours, language — if other than German)

V (1) + S (1)
Module taught in: German or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (30 to 60 minutes; also multiple choice) or
b) oral examination of one candidate each (30 to 60 minutes) or
c) oral examination in groups of up to 3 candidates (30 to 60 minutes) or
d) presentation (20 to 45 minutes)
Students will be informed about the method, length and scope of the assessment prior to the course.
Language of assessment: German and/or English
Assessment offered: Once a year, winter semester

Allocation of places

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Additional information

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Workload

150 h

Teaching cycle

Teaching cycle: Once a year, winter semester

Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title	Abbreviation
The Functional Proteome: Organization, Modulation and Dynamics	08-MBC-FPP-232-m01

Module coordinator	Module offered by
holder of the Chair of Biochemistry II	Chair of Biochemistry

ECTS	Method of grading	Only after succ. compl. of module(s)
10	numerical grade	--

Duration	Module level	Other prerequisites
1 semester	graduate	Students are highly recommended to complete module 08-MBC-FPV in the same semester.

Contents

The module enables in-depth familiarization with current scientific methods and working techniques in the field of the study of the proteome as well as its organization, dynamics and modulation within the framework of practical experiments. The focus is on functional proteome analyses using biochemical and mass spectrometric methods including bioinformatic data analysis, visualization and evaluation of the obtained results.

Intended learning outcomes

After participating in the module, students will be proficient in the techniques used. They are able to explain and critically reflect on the experiments carried out and to present and discuss the results in a scientifically correct and appropriate manner.

Courses (type, number of weekly contact hours, language — if other than German)

Ü (6)
Module taught in: German or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) log (approx. 10 to 20 pages) or
b) oral examination of one candidate each (30 to 60 minutes) or
c) oral examination in groups of up to 3 candidates (approx. 30 to 60 minutes) or
d) presentation (20 to 45 minutes)
Students will be informed about the method, length and scope of the assessment prior to the course.
Language of assessment: German and/or English
Assessment offered: Once a year, winter semester

Allocation of places

12
Should the number of applications exceed the number of available places, places will be allocated according to the number of subject semesters. Among applicants with the same number of subject semesters, places will be allocated by lot. A waiting list will be maintained and places re-allocated by lot as they become available.

Additional information

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Workload

300 h

Teaching cycle

Teaching cycle: Once a year, winter semester

Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Biophysics and Molecular Biotechnology			07-MS2BT-262-m01
Module coordinator		**Module offered by**	
holder of the Chair of Biotechnology and Biophysics		Faculty of Biology	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
10	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	Cannot be combined with 07-MS2BTB.	

Contents

This lecture provides a broad overview of biophysical techniques and their applications. The first part of the lecture discusses fundamental aspects of thermodynamics, kinetics and molecular interactions. The course then moves on to discuss biophysical methods that facilitate the investigation of individual cells down to the level of single molecules. Focus is on electromanipulation and dielectric spectroscopy of cells, biomembranes, electrophysiology, ion channels, protein folding, single-molecule fluorescence methods and high-resolution as well as dynamic microscopy.

Intended learning outcomes

Students will have acquired a knowledge of fundamental biophysical methods and their applications that will enable them to independently review relevant literature. In addition, they will have become acquainted with - or, where necessary, will be able to independently acquaint themselves with - biophysical mechanisms.

Courses (type, number of weekly contact hours, language — if other than German)

V (2) + S (1)
Module taught in: English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (30 to 60 minutes, including multiple choice questions) or
c) oral examination of one candidate each (30 to 60 minutes) or
d) oral examination in groups of up to 3 candidates (30 to 60 minutes)
Language of assessment: German and/or English

Allocation of places

MA Biochemie: 4
There is no limit to the number of participants for MA Biosciences students. Places are limited for MA Biochemistry students. Selection is based on academic progress (number of semesters completed); in case of a tie, places will be allocated by lottery; any places that become available after the initial registration period will be allocated by lottery.

Additional information

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Workload

300 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Literature seminar 1			08-MBC-LIT1-152-m01
Module coordinator			**Module offered by**
chairperson of examination committee Biochemie (Biochemistry)			Chair of Biochemistry
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
5	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

Students read assigned biochemistry-related publications on a particular topic in the life sciences and deliver presentations on those publications to their classmates. Those presentations will be followed by critical discussions of the relevant topics. Please contact the module coordinator in advance to find out if you can use this module in the Master's programme in Biochemistry.

Intended learning outcomes

Students have enhanced their ability to read and critically engage with current biochemistry-related literature in the field of the life sciences. They have enhanced their skills in the presentation and discussion of scientific information.

Courses (type, number of weekly contact hours, language — if other than German)

S (2)
Module taught in: German or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

presentation (20 to 40 minutes)
Language of assessment: German and/or English

Allocation of places

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Additional information

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Workload

150 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Single Cell Biology			03-98-SCB-192-m01
Module coordinator		**Module offered by**	
Helmholtz Institute of RNA-based Infection Research Würzburg		Faculty of Medicine	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
5	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

The Single Cell Biology course is at the interface of genomics, bioinformatics, biology and pathology. It will give an introduction of the most recent technologies for single cell analysis and an overview of the application of single cell biology across the medical field (cancer, immunology, cardiovascular diseases, and infectious diseases). Practical components will allow the students to be familiarized with the basic tools to perform data analysis.

Intended learning outcomes

Students are familiar with fundamental concepts of single cell biology throughout the life sciences and they can apply basic procedures to analyze single cell data sets. They recognize the significance and areas of application of the methods for medical diagnostics and translational research.

Courses (type, number of weekly contact hours, language — if other than German)

V (1.5) + Ü (0.5)
Module taught in: English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 60 minutes)
Language of assessment: English
creditable for bonus

Allocation of places

M.Sc.Biomed: 15
M.Sc. Biochem: 15
M.Sc. Biowis: 10
Selection process: allocation by lot

Additional information

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Workload

150 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Subfield - Molecular and Medical Cell Biology

(20 ECTS credits)

Module title			Abbreviation
Human genetics			03-MS2HG-152-m01
Module coordinator		**Module offered by**	
holder of the Chair of of Human Genetics		Faculty of Medicine	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
10	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
2 semester	graduate	--	

Contents

This module will discuss current topics in human genetics.

Intended learning outcomes

Students have developed the ability to understand relevant questions in human genetics and to discuss these in detail.

Courses (type, number of weekly contact hours, language — if other than German)

V (2) + S (2)
Module taught in: German or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (approx. 45 to 90 minutes) or
b) oral examination of one candidate each (20 to 30 minutes) or
c) oral examination in groups of up to 3 candidates (15 to 30 minutes per candidate)
Language of assessment: German and/or English

Allocation of places

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Additional information

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Workload

300 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Clinical-analytical Chemistry			08-PH-KAC-152-m01
Module coordinator			**Module offered by**
lecturer of lecture "Klinisch-analytische Chemie" (Clinical and Analytical Chemistry)			Institute of Pharmacy and Food Chemistry
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
5	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	
Contents			
This module discusses advanced topics in clinical analytical chemistry.			
Intended learning outcomes			
Students have developed an advanced knowledge of molecular biology.			
Courses (type, number of weekly contact hours, language — if other than German)			
V (3)			
Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)			
written examination (approx. 120 minutes)			
Allocation of places			
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Additional information			
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Workload			
150 h			
Teaching cycle			
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Referred to in LPO I (examination regulations for teaching-degree programmes)			
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Module title			Abbreviation
Practical course of clinical-analytical Chemistry			08-PH-KACP-152-m01
Module coordinator		**Module offered by**	
lecturer of lecture "Klinisch-analytische Chemie" (Clinical and Analytical Chemistry)		Institute of Pharmacy and Food Chemistry	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
5	(not) successfully completed	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	undergraduate	--	

Contents

This module covers practical topics in clinical chemistry and clinical diagnostics as well as the related analytical methods.

Intended learning outcomes

Students have developed a knowledge of clinical analytical chemistry and are able to apply it to practical experiments.

Courses (type, number of weekly contact hours, language — if other than German)

P (5)

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Vortestate/Nachtestate (pre and post-experiment examination talks approx. 15 minutes each, log approx. 5 to 10 pages each) and assessment of practical performance (2 to 4 random examinations)

Allocation of places

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Additional information

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Workload

150 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Microbiology 1			07-MS2M1-262-m01
Module coordinator		**Module offered by**	
holder of the Chair of Microbiology		Faculty of Biology	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
10	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	May not be combined with 07-MS2INF-BC.	

Contents

Fundamentals of molecular microbiology and infection biology, mechanisms of adherence and invasion, bacterial pathogenicity factors, regulation of virulence, mechanisms of host defence and pathogen interference, current methods in infection biology.

Intended learning outcomes

The students are able to understand fundamental theories of molecular microbiology and infection biology, emergence of infectious diseases.

Courses (type, number of weekly contact hours, language — if other than German)

V (2) + S (1)
Module taught in: German and/or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (30 to 60 minutes; also multiple choice) or
c) oral examination of one candidate each (30 to 60 minutes) or
d) oral examination in groups of up to 3 candidates (30 to 60 minutes)
Language of assessment: German and/or English

Allocation of places

MA Biochemie: 15
There is no limit to the number of participants for MA Biosciences students. Places are limited for MA Biochemistry students. Selection is based on academic progress (number of semesters completed); in case of a tie, places will be allocated by lottery; any places that become available after the initial registration period will be allocated by lottery.

Additional information

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Workload

300 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Microbiology 2			07-MS2M2-262-m01
Module coordinator		**Module offered by**	
holder of the Chair of Microbiology		Faculty of Biology	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
10	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	May not be combined with 07-MS2PA-BC.	

Contents

Fundamental principles of the mode of action of microbial pathogenicity factors will be presented using selected prokaryotic and eukaryotic pathogens as model organisms. In addition, current research methods in infection biology will be presented.

Intended learning outcomes

Students have gained fundamental knowledge in infection biology and pathogenicity research and the mechanisms behind infectious diseases.

Courses (type, number of weekly contact hours, language — if other than German)

V (2) + S (1)
Module taught in: German and/or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (30 to 60 minutes; also multiple choice) or
c) oral examination of one candidate each (30 to 60 minutes) or
d) oral examination in groups of up to 3 candidates (30 to 60 minutes)
Language of assessment: German and/or English

Allocation of places

MA Biochemie: 15
There is no limit to the number of participants for MA Biosciences students. Places are limited for MA Biochemistry students. Selection is based on academic progress (number of semesters completed); in case of a tie, places will be allocated by lottery; any places that become available after the initial registration period will be allocated by lottery.

Additional information

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Workload

300 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Infection Biology for Biochemistry Students			07-MS2INF-BC-262-m01
Module coordinator		**Module offered by**	
holder of the Chair of Microbiology		Faculty of Biology	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
5	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	May not be combined with 07-MS2M1.	

Contents

Fundamentals of molecular microbiology and infection biology, mechanisms of adherence and invasion, bacterial pathogenicity factors, regulation of virulence, mechanisms of host defence and pathogen interference, current methods in infection biology.

Intended learning outcomes

The students are able to understand fundamental theories of molecular microbiology and infection biology, emergence of infectious diseases.

Courses (type, number of weekly contact hours, language — if other than German)

V (2)
Module taught in: German and/or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (30 to 60 minutes; also multiple choice) or
c) oral examination of one candidate each (30 to 60 minutes) or
d) oral examination in groups of up to 3 candidates (30 to 60 minutes)
Language of assessment: German and/or English

Allocation of places

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Additional information

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Workload

150 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Pathogenicity of Microorganisms for Biochemistry Students			07-MS2PA-BC-262-m01
Module coordinator		**Module offered by**	
holder of the Chair of Microbiology		Faculty of Biology	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
5	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	May not be combined with 07-MS2M2.	

Contents

Fundamental principles of the mode of action of microbial pathogenicity factors will be presented using selected prokaryotic and eukaryotic pathogens as model organisms. In addition, current research methods in infection biology will be presented.

Intended learning outcomes

Students have gained fundamental knowledge in infection biology and pathogenicity research and the mechanisms behind infectious diseases.

Courses (type, number of weekly contact hours, language — if other than German)

V (2)
Module taught in: English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (30 to 60 minutes; also multiple choice) or
c) oral examination of one candidate each (30 to 60 minutes) or
d) oral examination in groups of up to 3 candidates (30 to 60 minutes)
Language of assessment: German and/or English

Allocation of places

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Additional information

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Workload

150 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Immunology 1			03-MS2IM1-152-m01
Module coordinator		**Module offered by**	
holder of the Professorship of Immunogenetics		Faculty of Medicine	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
10	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

Familiarity with the fundamentals of molecular and cellular immunology that allow a deeper understanding of immune-mediated defence mechanisms. This incorporates common literature readings, presentations and tests on selected immunology book chapters and recent original literature in English language.

Intended learning outcomes

Students will gain a knowledge of fundamental concepts and methods in molecular and cellular immunology and will be able to present and discuss these.

Courses (type, number of weekly contact hours, language — if other than German)

V (1) + S (2)
Module taught in: English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (approx. 45 to 90 minutes) or
b) log (20 to 30 pages) or
c) oral examination of one candidate each (20 to 30 minutes) or
d) oral examination in groups of up to 3 candidates (15 to 30 minutes per candidate) or
e) presentation (20 to 40 minutes)
Language of assessment: German and/or English
Assessment offered: Once a year, winter semester

Allocation of places

Biochemie (Biochemistry), Master's: 3 places. Places will be allocated according to the number of subject semesters. Among applicants with the same number of subject semesters, places will be allocated by lot. A waiting list will be maintained and places re-allocated by lot as they become available.

Additional information

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Workload

300 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Immunology 2			03-MS2IM2-152-m01
Module coordinator		**Module offered by**	
holder of the Professorship of Immunogenetics		Faculty of Medicine	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
10	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

Recent progress in molecular and cellular immunology. Deeper insights into selected immunology chapters , such as autoimmunity and immune modulation, development of the immune system, immunogenetics, evolution, infection immunology, and more. This incorporates common literature readings, presentations and tests on selected immunology book chapters and recent original literature.

Intended learning outcomes

Students are able to understand current problems in immunology and to discuss these in detail.

Courses (type, number of weekly contact hours, language — if other than German)

V (1) + S (2)
Module taught in: English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (approx. 45 to 90 minutes) or
b) log (20 to 30 pages) or
c) oral examination of one candidate each (20 to 30 minutes) or
d) oral examination in groups of up to 3 candidates (15 to 30 minutes per candidate) or
e) presentation (20 to 40 minutes)
Language of assessment: German and/or English
Assessment offered: Once a year, summer semester

Allocation of places

Biochemie (Biochemistry), Master's: 3 places. Places will be allocated according to the number of subject semesters. Among applicants with the same number of subject semesters, places will be allocated by lot. A waiting list will be maintained and places re-allocated by lot as they become available.

Additional information

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Workload

300 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Virology 1			03-MS2V1-152-m01
Module coordinator		**Module offered by**	
holder of the Chair of Virology		Faculty of Medicine	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
10	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

This module will discuss contemporary topics in virology.

Intended learning outcomes

Students are able to understand current problems in virology and to discuss these in detail.

Courses (type, number of weekly contact hours, language — if other than German)

V (1) + S (2)
Module taught in: English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (approx. 45 to 90 minutes) or
b) oral examination of one candidate each (20 to 30 minutes) or
c) oral examination in groups of up to 3 candidates (15 to 30 minutes per candidate)
Language of assessment: German and/or English
Assessment offered: Once a year, winter semester

Allocation of places

Biochemie (Biochemistry), Master's: 3 places. Places will be allocated according to the number of subject semesters. Among applicants with the same number of subject semesters, places will be allocated by lot. A waiting list will be maintained and places re-allocated by lot as they become available.

Additional information

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Workload

300 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Virology 2			03-MS2V2-152-m01
Module coordinator		**Module offered by**	
holder of the Chair of Virology		Faculty of Medicine	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
10	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

This module will discuss contemporary topics in virology.

Intended learning outcomes

Students are able to understand current problems in virology and to discuss these in detail.

Courses (type, number of weekly contact hours, language — if other than German)

V (1) + S (2)
Module taught in: English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (approx. 45 to 90 minutes) or
b) oral examination of one candidate each (20 to 30 minutes) or
c) oral examination in groups of up to 3 candidates (15 to 30 minutes per candidate)
Language of assessment: German and/or English
Assessment offered: Once a year, summer semester

Allocation of places

Biochemie (Biochemistry), Master's: 3 places. Places will be allocated according to the number of subject semesters. Among applicants with the same number of subject semesters, places will be allocated by lot. A waiting list will be maintained and places re-allocated by lot as they become available.

Additional information

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Workload

300 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Bacterial genetics - Infectiology			03-98-PBG-152-m01
Module coordinator		**Module offered by**	
Institute of Molecular Infection Biology		Faculty of Medicine	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
5	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	undergraduate	--	

Contents

Foundations and analytical approaches of bacterial genetics are taught based on selected questions from molecular microbiology. Genetic processes are analysed with the help of examples of gene transfer. Molecular genetic and functional biochemical pathways are presented using examples from microbiology.

Intended learning outcomes

Students have developed the ability to approach, analyse and interpret general problems in bacterial genetics based on individually assigned tasks, using techniques of modern molecular biology, microbiology and genetics. They also have developed skills in experimental design, bench work, data analysis and the presentation of scientific results both orally and in writing.

Courses (type, number of weekly contact hours, language — if other than German)

V (1) + S (1) + Ü (4)

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (approx. 45 to 90 minutes) or
b) log (20 to 30 pages) or
c) oral examination of one candidate each (20 to 30 minutes) or
d) oral examination in groups of up to 3 candidates (15 to 30 minutes per candidate) or
e) presentation (20 to 40 minutes)

Allocation of places

Biochemie (Biochemistry), Master's: 4 places. Places will be allocated according to the number of subject semesters. Among applicants with the same number of subject semesters, places will be allocated by lot. A waiting list will be maintained and places re-allocated by lot as they become available.

Additional information

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Workload

150 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Cardiovascular Biology			03-98-MVKB-152-m01
Module coordinator		**Module offered by**	
holder of the Chair of Experimental Biomedicine		Faculty of Medicine	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
5	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

Becoming familiar with the basics of the cardiovascular system by means of a lecture series. The first section comprises the anatomical, physiological and biochemical basis. In the second section these fundamentals will be deepened based on relevant cardiovascular diseases of platelets, the vasculature and the heart. In the context of these disorders, current and future targets for adequate therapies will be discussed.

Intended learning outcomes

Students have developed the ability to understand the molecular and physiological basics relevant for cardiovascular biology, with the focus on developmental biology, platelets and coagulation. These will be exemplified by stroke, myocardial disorders, metabolic syndrome, vasculitides and genetic causes. After attending the lecture series, students will be able to understand, describe and assign pathological and pathophysiological changes affecting the cardiovascular system.

Courses (type, number of weekly contact hours, language — if other than German)

V (2)
Module taught in: German or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (30 to 60 minutes) or
b) log (approx. 10 to 20 pages) or
c) oral examination of one candidate each (30 to 60 minutes) or
d) oral examination in groups of up to 3 candidates (approx. 30 to 60 minutes) or
e) presentation (20 to 45 minutes)
Students will be informed about the method, length and scope of the assessment prior to the course.
Language of assessment: German and/or English
Assessment offered: Once a year, winter semester

Allocation of places

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Additional information

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Workload

150 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Molecular Oncology			03-98-MVMO-152-m01
Module coordinator		**Module offered by**	
holder of the Chair of Biochemistry and Molecular Biology			
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
5	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

Molecular mechanisms of tumourigenesis; experimental dissection of tumours; metabolic reprogramming in cancer; visualising in vivo tumour progression and response to therapy; targeting Myc for tumour therapy; Wnt signalling and colorectal cancer; cell cycle and tumour suppressor genes; protein turnover in normal and cancer cells; molecular mechanisms of melanoma development; tumour immunology; stem cells and epigenetics; signal transduction and personalised cancer therapy; molecular pathology; infections and tumour development.

Intended learning outcomes

Students understand the current topics and challenges in tumour research and the methods used to address such challenges.

Courses (type, number of weekly contact hours, language — if other than German)

V (2)
Module taught in: German or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (30 to 60 minutes) or
b) log (approx. 10 to 20 pages) or
c) oral examination of one candidate each (30 to 60 minutes) or
d) oral examination in groups of up to 3 candidates (approx. 30 to 60 minutes) or
e) presentation (20 to 45 minutes)
Students will be informed about the method, length and scope of the assessment prior to the course.
Language of assessment: German and/or English
Assessment offered: Once a year, winter semester

Allocation of places

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Additional information

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Workload

150 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Clinical Oncology			03-ONC-CLIN-152-m01
Module coordinator		**Module offered by**	
holder of the Chair of Translational Oncology		Faculty of Medicine	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
5	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

In the module "Klinische Onkologie" ("Clinical Oncology"), various clinicians will present a current view of the disease "cancer". Topics will include an overview of different tumour entities (including cancers of the blood, skin, breast, lung, liver, colon, endocrine system), treatment modalities (e. g. immunotherapy, radiation-based therapy, personalised medicine), diagnostics, pathology, clinical studies.

Intended learning outcomes

An understanding of the biological commonalities and particularities of different tumour types. An understanding of the needs, possibilities and limitations of clinical approaches.

Courses (type, number of weekly contact hours, language — if other than German)

V (2)
Module taught in: German or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (30 to 60 minutes) or
c) oral examination of one candidate each (30 to 60 minutes) or
d) oral examination in groups of up to 3 candidates (approx. 30 to 60 minutes)
Students will be informed about the method, length and scope of the assessment prior to the course.
Language of assessment: German and/or English

Allocation of places

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Additional information

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Workload

150 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Stem Cell Biology			03-98-MVSZ-152-m01
Module coordinator		**Module offered by**	
holder of the Chair of Developmental Biochemistry		Faculty of Medicine	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
5	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

In this module, selected current problems from the fields of stem cell biology, cellular differentiation and regenerative medicine are used to provide basic knowledge as well as analytical approaches. The current state of research is considered on the basis of the historical context. Selected examples are used to learn about topic-specific contexts. Special emphasis is placed on the methodology used to study and characterize stem cells at the molecular level in vivo and in vitro. Bioethical and legal frameworks are discussed in the course of the lecture.

Intended learning outcomes

Necessary basic knowledge to work on, analyze and critically interpret questions from stem cell biology, cellular differentiation and regenerative medicine on the basis of current literature. A basic methodological competence for independent scientific work in the field of stem cell biology. Development of an ethical awareness in relation to the application of stem cells in biomedicine.

Courses (type, number of weekly contact hours, language — if other than German)

V (2)
Module taught in: German or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (30 to 60 minutes) or
b) log (approx. 10 to 20 pages) or
c) oral examination of one candidate each (30 to 60 minutes) or
d) oral examination in groups of up to 3 candidates (approx. 30 to 60 minutes) or
e) presentation (20 to 45 minutes)
Students will be informed about the method, length and scope of the assessment prior to the course.
Language of assessment: German and/or English
Assessment offered: Once a year, summer semester

Allocation of places

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Additional information

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Workload

150 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Clinical Neurobiology			03-98-MVKN-152-m01
Module coordinator		**Module offered by**	
Managing Director of the Institute of Clinical Neurobiology		Faculty of Medicine	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
5	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

Students will get a theoretical introduction and amplification of topics in clinical neurobiology. The following topics will be discussed: introduction to neurons and glia, ion channels and membrane potential, ion channelopathies, synapses, transmitter release, NMJ, myasthenia gravis, cerebellum, basal ganglia, ataxia and Morbus Parkinson, somatosensory system, touch, pain, schizophrenia and autism spectrum disorders, disorders of cognition, muscle and muscle diseases, anatomy and function of the motor system, spinal reflexes, motoneuron diseases, hippocampus, learning and memory, anterograde amnesia, visual agnosia, cortex and the limbic system, emotions, disorders of conscious and unconscious mental processes, attention, smell and taste and hearing , sleep, EEG, epilepsy, vision and diseases of the visual system. The accompanied literature seminars are based on fundamental and current literature on lecture-relevant topics to discuss experimental and methodological approaches and with this promoting translational thinking. Using student presentations of current research results, the earned knowledge in neurobiology is recessed.

Intended learning outcomes

Students who successfully completed this module are able to remind and understand the current theoretical concepts in neurobiology. Furthermore, students are able to classify clinical aspects of neurobiology with the focus to disease mechanisms at molecular, cellular, and physiological levels. Based on current experimental data evaluation, students are able to critical read and evaluate current publications in neurobiology as well as extract relevant information from recent publications.

Courses (type, number of weekly contact hours, language — if other than German)

V (2) + S (2)
Module taught in: English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (30 to 60 minutes) or
b) oral examination of one candidate each (30 to 60 minutes) or
c) oral examination in groups of up to 3 candidates (approx. 30 to 60 minutes) or
d) presentation (20 to 45 minutes)
Students will be informed about the method, length and scope of the assessment prior to the course.
Language of assessment: English

Allocation of places

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Additional information

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Workload

150 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Tissue Engineering / Functional Materials			03-98-MVTF-152-m01
Module coordinator		**Module offered by**	
holder of the Chair of Tissue Engineering and Regenerative Medicine		Faculty of Medicine	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
5	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

Cell culture technology, basics of tissue engineering, test systems as an alternative to animal experiments skin, intestine, lung, trachea, blood-brain barrier, tumors and other diseases. The development of cell-based transplants is discussed, as well as the regulatory basis for the approval of these and of medical devices and drugs. In detail, these are REACH (Registration, Evaluation, Restriction and Authorization of Chemicals), the Medical Devices and Drugs Act, GLP (Good Laboratory Practice), GMP (Good Manufacturing Practice) and GCP (Good Clinical Practice).

Intended learning outcomes

The student has expertise in tissue engineering, regenerative medicine, bioprocess engineering, test systems and basic relationships in the field of cell biology, metabolism, differentiation, adhesion to surfaces and mechanobiology. The student has methodological competence in quality management. The contents taught in the course lead to a deeper understanding of these competence fields and enable the application, which allows an independent assessment by analyzing publications or questions. For this purpose, the student should be able to understand a scientific publication in this field, to acquire additional background knowledge independently and, after analyzing the experimental results, to evaluate and discuss them critically.

Courses (type, number of weekly contact hours, language — if other than German)

V (2)
Module taught in: German or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (30 to 60 minutes) or
b) log (approx. 10 to 20 pages) or
c) oral examination of one candidate each (30 to 60 minutes) or
d) oral examination in groups of up to 3 candidates (approx. 30 to 60 minutes) or
e) presentation (20 to 45 minutes)
Students will be informed about the method, length and scope of the assessment prior to the course.
Language of assessment: German and/or English
Assessment offered: Once a year, winter semester

Allocation of places

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Additional information

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Workload

150 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Literature seminar 2			08-MBC-LIT2-152-m01
Module coordinator			**Module offered by**
chairperson of examination committee Biochemie (Biochemistry)			Chair of Biochemistry
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
5	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

Students read assigned biochemistry-related publications on a particular topic in the life sciences and deliver presentations on those publications to their classmates. Those presentations will be followed by critical discussions of the relevant topics. Please contact the module coordinator in advance to find out if you can use this module in the Master's programme in Biochemistry.

Intended learning outcomes

Students have enhanced their ability to read and critically engage with current biochemistry-related literature in the field of the life sciences. They have enhanced their skills in the presentation and discussion of scientific information.

Courses (type, number of weekly contact hours, language — if other than German)

S (2)
Module taught in: German or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

presentation (20 to 40 minutes)
Language of assessment: German and/or English

Allocation of places

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Additional information

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Workload

150 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Tumor Genetics			03-MBC-TG-161-m01
Module coordinator		**Module offered by**	
holder of the Professorship Human Genetics at Institute for Human Genetics		Institute of Human Genetics	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
5	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

Basics on human genetics (inheritance patterns, mutation types, etc.), hereditary cancer (breast & ovarian cancer, HNPCC, FAP, etc.), cancer syndromes, tumor cytogenetics, animal models in cancer genetics, genetic techniques (NGS, genome engineering, etc.)

Intended learning outcomes

The students acquired broad knowledge in the field of tumor genetics. Exemplify pathomechanisms in hereditary cancer. Name and illustrate genetic methods. Apply the acquired knowledge to scientific questions in the field of tumor genetics. Independent preparation and presentation of scientific articles. Acquire the ability to critically discuss latest developments in tumor genetics.

Courses (type, number of weekly contact hours, language — if other than German)

V (1) + S (1)
Module taught in: English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (approx. 45 to 90 minutes) or
b) log (20 to 30 pages) or
c) oral examination of one candidate each (20 to 30 minutes) or
d) oral examination in groups of up to 3 candidates (15 to 30 minutes per candidate) or
e) presentation (20 to 40 minutes)
Language of assessment: German and/or English

Allocation of places

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Additional information

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Workload

150 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Focus - Molecular Oncology

(50 ECTS credits)

Subfield - Tumor Biology

(35 ECTS credits)

Module title			Abbreviation
Molecular Oncology			03-98-MVMO-152-m01
Module coordinator		**Module offered by**	
holder of the Chair of Biochemistry and Molecular Biology			
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
5	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

Molecular mechanisms of tumourigenesis; experimental dissection of tumours; metabolic reprogramming in cancer; visualising in vivo tumour progression and response to therapy; targeting Myc for tumour therapy; Wnt signalling and colorectal cancer; cell cycle and tumour suppressor genes; protein turnover in normal and cancer cells; molecular mechanisms of melanoma development; tumour immunology; stem cells and epigenetics; signal transduction and personalised cancer therapy; molecular pathology; infections and tumour development.

Intended learning outcomes

Students understand the current topics and challenges in tumour research and the methods used to address such challenges.

Courses (type, number of weekly contact hours, language — if other than German)

V (2)
Module taught in: German or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (30 to 60 minutes) or
b) log (approx. 10 to 20 pages) or
c) oral examination of one candidate each (30 to 60 minutes) or
d) oral examination in groups of up to 3 candidates (approx. 30 to 60 minutes) or
e) presentation (20 to 45 minutes)
Students will be informed about the method, length and scope of the assessment prior to the course.
Language of assessment: German and/or English
Assessment offered: Once a year, winter semester

Allocation of places

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Additional information

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Workload

150 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Clinical Oncology			03-ONC-CLIN-152-m01
Module coordinator		**Module offered by**	
holder of the Chair of Translational Oncology		Faculty of Medicine	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
5	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

In the module "Klinische Onkologie" ("Clinical Oncology"), various clinicians will present a current view of the disease "cancer". Topics will include an overview of different tumour entities (including cancers of the blood, skin, breast, lung, liver, colon, endocrine system), treatment modalities (e. g. immunotherapy, radiation-based therapy, personalised medicine), diagnostics, pathology, clinical studies.

Intended learning outcomes

An understanding of the biological commonalities and particularities of different tumour types. An understanding of the needs, possibilities and limitations of clinical approaches.

Courses (type, number of weekly contact hours, language — if other than German)

V (2)
Module taught in: German or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (30 to 60 minutes) or
c) oral examination of one candidate each (30 to 60 minutes) or
d) oral examination in groups of up to 3 candidates (approx. 30 to 60 minutes)
Students will be informed about the method, length and scope of the assessment prior to the course.
Language of assessment: German and/or English

Allocation of places

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Additional information

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Workload

150 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Oncology Seminar 1			03-ONC-SEM1-152-m01
Module coordinator		**Module offered by**	
holder of the Chair of Biochemistry and Molecular Biology			
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
5	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

In the module "Seminare in Onkologie" ("Oncology Seminar 1"), selected original publications in cancer research are read and critically discussed. Participants are strongly advised to concurrently attend the lecture "Molecular Oncology" (03-ONC-MOLO).

Intended learning outcomes

Critical reading and understanding of primary literature in molecular biology and cancer research.

Courses (type, number of weekly contact hours, language — if other than German)

S (1)
Module taught in: German or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (approx. 45 to 90 minutes) or
b) presentation (20 to 40 minutes)
Language of assessment: German and/or English

Allocation of places

Biochemie (Biochemistry), Master's: 18 places. Places will be allocated according to the number of subject semesters. Among applicants with the same number of subject semesters, places will be allocated by lot. A waiting list will be maintained and places re-allocated by lot as they become available.

Additional information

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Workload

150 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Oncology Seminar 2			03-ONC-SEM2-152-m01
Module coordinator		**Module offered by**	
holder of the Chair of Translational Oncology		Faculty of Medicine	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
5	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

In the module "Seminare in Onkologie 2" ("Oncology Seminar 2"), selected original publications in cancer research are read and critically discussed. Participants are strongly advised to concurrently attend the lecture "Clinical Oncology" (03-ONC-CLIN).

Intended learning outcomes

Critical reading and understanding of primary literature in molecular biology and cancer research.

Courses (type, number of weekly contact hours, language — if other than German)

S (1)
Module taught in: German or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (approx. 45 to 90 minutes) or
b) presentation (20 to 40 minutes)
Language of assessment: German and/or English

Allocation of places

Biochemie (Biochemistry), Master's: 18 places. Places will be allocated according to the number of subject semesters. Among applicants with the same number of subject semesters, places will be allocated by lot. A waiting list will be maintained and places re-allocated by lot as they become available.

Additional information

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Workload

150 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Experimental Tumor Biology			03-ONC-TUMP-152-m01
Module coordinator		**Module offered by**	
holder of the Chair of Biochemistry and Molecular Biology			
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
10	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

In the practical course "Tumorbiologie-Praktikum" ("Experimental Tumour Biology"), students learn about various model systems (tissue culture and animal models) and experimental approaches in cancer research (e. g. flow cytometry, tissue staining & microscopy, quantitative expression analysis, metabolic analyses). Prior (or concurrent) attendance of the lecture "Molekulare Onkologie" ("Molecular Oncology") and the course "Seminare in Onkologie" ("Seminars in Oncology") 1 or 2 is required.

Intended learning outcomes

Knowledge of selected tumour models and techniques for experimental tumour research. Ability to read and understand relevant primary literature.

Courses (type, number of weekly contact hours, language — if other than German)

P (8)
Module taught in: German or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) Log (20 to 30 pages) or
b) presentation (20 to 40 minutes)
Language of assessment: German and/or English

Allocation of places

Biochemie (Biochemistry), Master's: 18 places. Places will be allocated according to the number of subject semesters. Among applicants with the same number of subject semesters, places will be allocated by lot. A waiting list will be maintained and places re-allocated by lot as they become available.

Additional information

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Workload

300 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Lab rotation Oncology			03-ONC-LAB1-152-m01
Module coordinator		**Module offered by**	
lecturers Medicine		Faculty of Chemistry and Pharmacy	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
5	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

Under the guidance of experienced scientists, students will work on an ongoing project in cancer research in a research laboratory.

Intended learning outcomes

Hands-on experience with experimental cancer research.

Courses (type, number of weekly contact hours, language — if other than German)

P (6)
Module taught in: German or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) Log (20 to 30 pages) or
b) presentation (20 to 40 minutes)
Language of assessment: German and/or English

Allocation of places

Biochemie (Biochemistry), Master's: 18 places. Places will be allocated according to the number of subject semesters. Among applicants with the same number of subject semesters, places will be allocated by lot. A waiting list will be maintained and places re-allocated by lot as they become available.

Additional information

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Workload

150 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Subfield - Structural and Functional Biochemistry

(15 ECTS credits)

Module title			Abbreviation
RNA worlds			08-MBC-RNAW-152-m01
Module coordinator		**Module offered by**	
holder of the Chair of Biochemistry		Chair of Biochemistry	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
5	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

This module comprises a lecture and a seminar. It provides a detailed and in-depth exploration of the current state of research on RNA-protein complexes, their structures and functions as well as the theoretical principles of cutting-edge RNA-based research methods.

Intended learning outcomes

Students have become familiar with the topics discussed in the module and are able to transfer what they have learned to new problems. They are able to situate new research findings within the context of existing knowledge as well as to determine the significance of those findings.

Courses (type, number of weekly contact hours, language — if other than German)

V (1) + S (1)
Module taught in: German or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (30 to 60 minutes) or
b) log (approx. 10 to 20 pages) or
c) oral examination of one candidate each (30 to 60 minutes) or
d) oral examination in groups of up to 3 candidates (approx. 30 to 60 minutes) or
e) presentation (20 to 45 minutes)
Students will be informed about the method, length and scope of the assessment prior to the course.
Language of assessment: German and/or English

Allocation of places

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Additional information

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Workload

150 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Life cycle of proteins			08-MBC-LCP-152-m01
Module coordinator		**Module offered by**	
holder of the Chair of Biochemistry		Chair of Biochemistry	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
5	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

This module comprises a lecture and a seminar. It provides a detailed and in-depth exploration of the current state of research on the regulation and control of the entire life cycle of proteins.

Intended learning outcomes

Students have become familiar with the topics discussed in the module and are able to transfer what they have learned to new problems. They are able to situate new research findings within the context of existing knowledge as well as to determine the significance of those findings.

Courses (type, number of weekly contact hours, language — if other than German)

V (1) + S (1)
Module taught in: German or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (30 to 60 minutes) or
b) log (approx. 10 to 20 pages) or
c) oral examination of one candidate each (30 to 60 minutes) or
d) oral examination in groups of up to 3 candidates (approx. 30 to 60 minutes) or
e) presentation (20 to 45 minutes)
Students will be informed about the method, length and scope of the assessment prior to the course.
Language of assessment: German and/or English

Allocation of places

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Additional information

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Workload

150 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Structure and function of RNA-protein complexes			08-MBC-RNP-152-m01
Module coordinator		**Module offered by**	
holder of the Chair of Biochemistry		Chair of Biochemistry	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
10	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

Performing practical experiments, students will actively engage with scientific methods and lab techniques for the investigation of RNA-protein complexes.

Intended learning outcomes

Students master the techniques used in the practical course. They are able to explain and critically reflect upon the experiments they have performed as well as to present and discuss their findings in a written report.

Courses (type, number of weekly contact hours, language — if other than German)

Ü (6)
Module taught in: German or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) log (20 to 30 pages) or
b) oral examination of one candidate each (20 to 30 minutes) or
c) oral examination in groups of up to 3 candidates (15 to 30 minutes per candidate) or
d) presentation (20 to 40 minutes)
Language of assessment: German and/or English
Assessment offered: Once a year, winter semester

Allocation of places

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Additional information

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Workload

300 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Protein quality control			08-MBC-PQK-152-m01
Module coordinator		**Module offered by**	
holder of the Chair of Biochemistry		Chair of Biochemistry	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
10	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

Performing practical experiments, students will actively engage with scientific methods and lab techniques in the field of protein degradation in eukaryotes.

Intended learning outcomes

Students master the techniques used in the practical course. They are able to explain and critically reflect upon the experiments they have performed as well as to present and discuss their findings in a written report.

Courses (type, number of weekly contact hours, language — if other than German)

Ü (6)
Module taught in: German or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) log (20 to 30 pages) or
b) oral examination of one candidate each (20 to 30 minutes) or
c) oral examination in groups of up to 3 candidates (15 to 30 minutes per candidate) or
d) presentation (20 to 40 minutes)
Language of assessment: German and/or English
Assessment offered: Once a year, summer semester

Allocation of places

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Additional information

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Workload

300 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title	Abbreviation
Macromolecular Crystallography	08-MBC-MK-152-m01

Module coordinator	Module offered by
holder of the Chair of Biochemistry	Chair of Biochemistry

ECTS	Method of grading	Only after succ. compl. of module(s)
10	numerical grade	--

Duration	Module level	Other prerequisites
1 semester	graduate	--

Contents

This module comprises a lecture, exercises and a lab course. The lecture will discuss the following topics: biophysical characterisation of protein samples prior to crystallisation; manual and high-throughput methods for protein crystallisation; X-ray generators and synchrotrons, properties of X-rays; data collection using different detector systems; symmetry properties of molecules, point groups and space groups; the phase problem and solution of that problem using multiple isomorphous replacement, anomalous diffraction and molecular replacement; improvement of experimental phases by solvent flattening and molecular averaging; manual and automated model building; refinement procedures and analysis of the experimentally determined structures. The exercises will give students the opportunity to explore the topics discussed in the lecture in more depth. In the lab course, students will carry out all of the steps involved in protein structure analysis that were discussed in the lecture. They will use lysozyme as an example enzyme and will carry out the following steps autonomously: crystallisation of the purified protein, data collection on the Institute's diffractometer, solution of the phase problem using the anomalous signal from intrinsic sulphur atoms, model building, structure refinement, analysis of the refined structure.

Intended learning outcomes

Students will develop a thorough knowledge of modern macromolecular crystallographic methods. The lecture will provide an in-depth exploration of those methods, the exercise will give students the opportunity to engage with the most intellectually challenging aspects in more detail, and the lab course will give them practice in using the methods. At the end of the module, students will be able to perform crystallographic structure analyses for their Master's or doctoral thesis.

Courses (type, number of weekly contact hours, language — if other than German)

V (2) + Ü (1) + P (5)
Module taught in: German or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (approx. 45 to 90 minutes) or
b) log (20 to 30 pages) or
c) oral examination of one candidate each (20 to 30 minutes) or
d) oral examination in groups of up to 3 candidates (15 to 30 minutes per candidate) or
e) presentation (20 to 40 minutes)
Language of assessment: German and/or English
Assessment offered: Once a year, summer semester

Allocation of places

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Additional information

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Workload

300 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)
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Module title	Abbreviation
Mass-Spectrometry and Proteomics	08-MBC-MSP-161-m01

Module coordinator	Module offered by
holder of the Chair of Biochemistry	Chair of Biochemistry

ECTS	Method of grading	Only after succ. compl. of module(s)
5	numerical grade	--

Duration	Module level	Other prerequisites
1 semester	graduate	--

Contents

This module comprises a lecture, a seminar and a lab course. The lecture discusses the fundamental principles of the mass spectrometry of biomolecules. Topics to be covered in the lecture include ESI and MALDI ionisation techniques as well as the operating principles of TOF, Orbitrap and other mass analysers. The lecture also provides an introduction to CID and ETD fragmentation techniques, peptide and protein separation methods as well as the analysis of mass spectrometric data (protein databases, FDR, GO terms, etc.). It gives an overview of quantitative proteomics with a special focus on different stable isotope quantification methods (e.g. SILAC, N15 labelling, iTRAQ) and provides an insight into the mass spectrometric analysis of post-translational modifications. The seminar covers the fundamental principles of the analysis of mass spectrometric data. It introduces students to different software packages and gives them the opportunity to independently develop solutions to a range of problems. In the lab course, students will use affinity purification to isolate a protein complex from yeast. They will then use 1D-SDS-PAGE to separate that complex and will proteolytically cleave it in the gel. Afterwards, students will use nano-LC-MS/MS to analyse the peptides thus obtained and will conduct a data analysis to identify specific interaction partners and post-translational modifications.

Intended learning outcomes

Students have learned the theoretical foundations of mass spectrometry protein and proteomic analysis. They have learned how to use proteomic data analysis software tools. Students have become proficient in the affinity purification of protein complexes and have learned the steps involved in the preparation of samples for mass spectrometry protein analysis, e.g. SDS-PAGE and in-gel digestion. They have gained an insight into how to operate a nanoHPLC-coupled mass spectrometer.

Courses (type, number of weekly contact hours, language — if other than German)

V (2) + S (1) + P (2)
Module taught in: German or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (approx. 45 to 90 minutes) or
b) log (20 to 30 pages) or
c) oral examination of one candidate each (20 to 30 minutes) or
d) oral examination in groups of up to 3 candidates (15 to 30 minutes per candidate) or
e) presentation (20 to 40 minutes)
Language of assessment: German and/or English
Assessment offered: Once a year, winter semester

Allocation of places

67 places.

Additional information

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Workload

150 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)
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Module title			Abbreviation
Modern Drug Research 1: Basics and Drug Design			08-MCM3-242-m01
Module coordinator		**Module offered by**	
lecturers of Pharmaceutical Chemistry		Institute of Pharmacy and Food Chemistry	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
5	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

Fundamentals: Phases of drug development, principles of drug action, pharmacokinetics and biotransformation; strategies of drug discovery, drug targets, chemical space of drug discovery, protein-ligand interactions, structure-activity-relationships (SAR), bioisosterism, prodrug strategies.
Experimental methods: binding assays, enzymatic assays, biophysical methods, high-throughput-screening (HTS).
Theoretical methods and drug design: virtual screening, ligand-based methods, QSAR, pharmacophore models, structure-based drug design, docking, simulation methods, machine learning (AI).
Case studies (drug discovery, design and optimization)

Intended learning outcomes

The students master the fundamentals of drug development, the strategies of drug discovery and the applied theoretical and experimental methods. They can understand and critically question the essential content of current scientifc publications in drug research. They are able to carry out a basic virtual screen and to evaluate its results.

Courses (type, number of weekly contact hours, language — if other than German)

S (2) + Ü (1)
Module taught in: German or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) presentation (approx. 30 minutes) or
b) written examination (approx. 45 to 90 minutes)
Language of assessment: German and/or English

Allocation of places

22 places.
16 places for students of the Master's degree programme Chemie (Chemistry): Places will be allocated according to the same number of subject semesters; students who have chosen Medizinische Chemie (Medicinal Chemistry) as their focus will be given preferential consideration.
6 places for students of the Master's degree programme Biochemie (Biochemistry): Places will be allocated according to the number of subject semesters; among applicants with the same number of subject semesters, places will be allocated by lot.
2 places for students of the Master's degree programme MINT-Lehramt PLUS: Places will be allocated according to the number of subject semesters; among applicants with the same number of subject semesters, places will be allocated by lot ; a waiting list will be maintained and places re-allocated by lot as they become available.

Additional information

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Workload

150 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)
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Module title			Abbreviation
Modern Drug Research 2: Technologies - Targets - Modalities			08-MCM4-242-m01
Module coordinator		**Module offered by**	
lecturers of Pharmaceutical Chemistry		Institute of Pharmacy and Food Chemistry	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
5	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

1. DNA-encoded library technology for small molecule screening.
2. Phage display and chemical modification of peptides in display libraries.
3. Medicinal Chemistry in the Pharmaceutical Industry, case studies presented by invited external speakers.
4. Entrepreneurship in the life sciences: start-ups, biotech, and private equity.
5. Protein-protein interactions as drug targets and modalities to inhibit them.
6. How not to perform the art of Medicinal Chemistry: Dirty Drugs, PAINS, frequent hitters, and impurities from compound synthesis as confounders
7. Therapeutic nucleic acid drugs
8. Multi-target drugs
9. Pharmacokinetic aspects in drug development
10Modern strategies in drug delivery

Intended learning outcomes

The students acquire basic knowledge of the terminology of medicinal chemistry, technologies for drug identification; exemplary biologics (oligonucleotides, peptides), properties of protein-protein-interaction inhibitors, basic knowledge of the industrial pharmaceutical research process, including entrepreneurship aspects, as well as of the compound optimization cycles and can confidently apply this knowledge in solving Medicinal Chemistry-related tasks.

By successfully completing this module, students will be able to,

- explain the processes of pharmaceutical research and applications in industry.
- understand the underlying principles for the action of biological drugs.
- understand different technologies for drug identification.
- understand pharmacokinetic challenges to drug development.
- understand modern technologies for drug delivery.
- describe different strategies for protein-protein interaction inhibition and to draw conclusions about possible consequences of protein-protein interaction inhibition from chemical structural features.
- to develop interdisciplinary solution strategies for practical problems at the interface between chemistry, pharmacology and biophysics for basic research and biomedical applications.

Courses (type, number of weekly contact hours, language — if other than German)

S (2)
Module taught in: German or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (approx. 45 to 90 minutes) or
b) oral examination of one candidate each (20 to 30 minutes)
Language of assessment: German and/or English

Allocation of places

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Additional information

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Workload
150 h
Teaching cycle
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Referred to in LPO I (examination regulations for teaching-degree programmes)
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Module title			Abbreviation
Biophysics of Proteins			03-MBC-PBP-172-m01
Module coordinator		**Module offered by**	
Chair of Rudolf Virchow Center for Experimental Biomedicine		Faculty of Medicine	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
5	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

The module "Protein Biophysics" will provide participants with detailed insights into the biophysical characterization of proteins. We will deal both with soluble model proteins (Dr. Sonja Lorenz) and with the particular challenges of membrane protein research (Dr. Sebastian Geibel). The module contains a lecture part that deals with the basics of different biophysical methods to characterize protein stability, oligomerization behavior and shape. Among others, small angle X-ray scattering (SAXS), circular dichroism (CD) spectroscopy, fluorimetry (DSC) and light scattering (DLS + MALS) are discussed. The lectures will be complemented by short presentations on selected topics. In the practical part of the course, the techniques discussed will be applied using self-isolated proteins, data will be analysed with computer support and interpreted scientifically.

Intended learning outcomes

The participants get an overview of the manifold biophysical methods for characterizing proteins and the particularities of working with membrane proteins. The acquired knowledge ranges from the theoretical basics of the methods to their practical application to the scientific analysis and interpretation of the data and should give a realistic impression of the researcher's life.

Courses (type, number of weekly contact hours, language — if other than German)

V (2) + S (1) + P (2)
Module taught in: English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (approx. 45 to 90 minutes) or
b) log (20 to 30 pages) or
c) oral examination of one candidate each (20 to 30 minutes) or
d) oral examination in groups of up to 3 candidates (15 to 30 minutes per candidate) or
e) presentation (20 to 40 minutes)
Language of assessment: German and/or English

Allocation of places

Biochemie (Biochemistry) Master's: 63 places.

Additional information

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Workload

150 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title	Abbreviation
Electron microscopy and image processing in structural biology	08-MBC-EMV-172-m01

Module coordinator	Module offered by
holder of the Chair of Biochemistry	Chair of Biochemistry

ECTS	Method of grading	Only after succ. compl. of module(s)
5	numerical grade	--

Duration	Module level	Other prerequisites
1 semester	graduate	--

Contents

The module "Electron Microscopy and Image Processing in Structural Biology" contains a lecture part which explains the basics of electron microscopy and image processing. First, the components of the electron microscope, beam path, image formation and contrast transmission are explained. Subsequently, different methods of sample preparation for electron microscopy in structural biology will be discussed as well as strategies for instrument alignment and data acquisition. The second part of the lecture concentrates on the processing of image data. The focus is on the principles of single image analysis. This includes the alignment of image data, their classification and three-dimensional image reconstruction. DeNovo and iterative methods of 3D image reconstruction are discussed. The learned principles are then applied to the special cases of 2D crystal analysis and tomography. Finally, micro electron diffraction is presented as an alternative to X-ray structure analysis. In the seminar part of the module some aspects of the lecture are deepened on the basis of case studies from the literature. The students will read these case studies in advance. In this work they are guided through a catalogue of questions. Some of the questions will be addressed independently in a written homework in advance. Most case studies will be presented by one student each. All case studies will be explained in a discussion. The participants develop a critical understanding of the advantages and limitations of the method. Some selected topics will be further deepened by arithmetic exercises.

Intended learning outcomes

The participants will learn the theoretical basics of electron microscopy and image processing in structural biology on a broad basis. They will get an overview of key strategies of the method, which are essential for structure elucidation. These can be applied and deepened in a practical course. In the end, all participants will be able to understand, communicate and critically evaluate primary literature on this method.

Courses (type, number of weekly contact hours, language — if other than German)

V (1) + S (1)
Module taught in: German or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (approx. 45 to 90 minutes) or
b) log (20 to 30 pages) or
c) oral examination of one candidate each (20 to 30 minutes) or
d) oral examination in groups of up to 3 candidates (15 to 30 minutes per candidate) or
e) presentation (20 to 40 minutes)
Language of assessment: German and/or English

Allocation of places

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Additional information

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Workload

150 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)
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Module title	Abbreviation
Practical course of electron microscopy and image processing	08-MBC-EMP-172-m01

Module coordinator	Module offered by
holder of the Chair of Biochemistry	Chair of Biochemistry

ECTS	Method of grading	Only after succ. compl. of module(s)
10	numerical grade	--

Duration	Module level	Other prerequisites
1 semester	graduate	--

Contents

The module "Practical Course Electron Microscopy and Single Image Processing" consists of an electron microscopy part and an image processing part. In the electron microscopy part the participants get to know the different elements of the electron microscope and how they work. Aspects of alignment, focusing and data acquisition will be developed. The participants will then use different preparation methods for electron microscopy (grid preparation, negative contrast and vitrification). The samples are then imaged in an electron microscope. Sample and data optimization are developed and data sets are created for further image processing. In the image processing part, the participants are first introduced to general aspects of computer operation under Linux (basic Linux commands, basic shell scripting). On this basis, the participants determine the structure of a protein complex from a real test data set. They learn step by step how to select good images, how to correct data for image-dependent aberrations and how to normalize, mask and filter image data. With the data prepared in this way, the participants will determine the characteristic views of the complex (2D classification) and combine these with various methods to form a DeNovo model. This model is then refined in an iterative process. In the second part of the image processing practical course the participants apply what they have learned to their own data. At the end of the practical course the participants present the different working steps and exchange experiences. The practical part of the electron microscopy practical course and the image processing practical course on test data will be summarized in a protocol. The results on the own data are presented in the form of a scientific publication, which requires a corresponding literature work and the creation of more complex images.

Intended learning outcomes

The participants will be taught the skills to prepare an already purified biological complex for structure determination with the help of electron microscopy and to independently determine its structure de novo from electron microscopic data. The participants will acquire a practical understanding for the data acquisition at the electron microscope and will be able to plan and carry out a corresponding experiment with technical support in the future. The participants will further develop the following key qualifications in the course: Computer skills (insights into Linux), team skills (working in teams of 2-3 students with varying composition), communication skills (oral and written presentation of results).

Courses (type, number of weekly contact hours, language — if other than German)

P (8)
Module taught in: German or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) log (20 to 30 pages) or
b) oral examination of one candidate each (20 to 30 minutes) or
c) oral examination in groups of up to 3 candidates (15 to 30 minutes per candidate) or
d) presentation (20 to 40 minutes)
Language of assessment: German and/or English
Assessment offered: Once a year, summer semester

Allocation of places

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Additional information

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Workload
300 h
Teaching cycle
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Referred to in LPO I (examination regulations for teaching-degree programmes)
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Module title			Abbreviation
Functional Proteomics: Deciphering Protein Worlds			08-MBC-FPV-232-m01
Module coordinator		**Module offered by**	
holder of the Chair of Biochemistry II		Chair of Biochemistry	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
5	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

The module provides in lecture and seminar the current state of the art in the field of functional proteomics as well as the theoretical basis of state-of-the-art methods of biomolecular mass spectrometry for the study of organization, dynamics and modulation of the proteome of eukaryotic cells. Emphasis is placed on quantitative strategies for the functional analysis of metabolic cell organelles, protein machines, and signaling and proteostasis networks.

Intended learning outcomes

After participation in the module events, the students are familiar with the contents taught. They can explain advantages and disadvantages of protein mass spectrometry methods, know a wide range of applications of the key methods and can use them to address new biological questions.

Courses (type, number of weekly contact hours, language — if other than German)

V (1) + S (1)
Module taught in: German or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (30 to 60 minutes; also multiple choice) or
b) oral examination of one candidate each (30 to 60 minutes) or
c) oral examination in groups of up to 3 candidates (30 to 60 minutes) or
d) presentation (20 to 45 minutes)
Students will be informed about the method, length and scope of the assessment prior to the course.
Language of assessment: German and/or English
Assessment offered: Once a year, winter semester

Allocation of places

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Additional information

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Workload

150 h

Teaching cycle

Teaching cycle: Once a year, winter semester

Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
The Functional Proteome: Organization, Modulation and Dynamics			08-MBC-FPP-232-m01
Module coordinator		**Module offered by**	
holder of the Chair of Biochemistry II		Chair of Biochemistry	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
10	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	Students are highly recommended to complete module 08-MBC-FPV in the same semester.	

Contents

The module enables in-depth familiarization with current scientific methods and working techniques in the field of the study of the proteome as well as its organization, dynamics and modulation within the framework of practical experiments. The focus is on functional proteome analyses using biochemical and mass spectrometric methods including bioinformatic data analysis, visualization and evaluation of the obtained results.

Intended learning outcomes

After participating in the module, students will be proficient in the techniques used. They are able to explain and critically reflect on the experiments carried out and to present and discuss the results in a scientifically correct and appropriate manner.

Courses (type, number of weekly contact hours, language — if other than German)

Ü (6)
Module taught in: German or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) log (approx. 10 to 20 pages) or
b) oral examination of one candidate each (30 to 60 minutes) or
c) oral examination in groups of up to 3 candidates (approx. 30 to 60 minutes) or
d) presentation (20 to 45 minutes)
Students will be informed about the method, length and scope of the assessment prior to the course.
Language of assessment: German and/or English
Assessment offered: Once a year, winter semester

Allocation of places

12
Should the number of applications exceed the number of available places, places will be allocated according to the number of subject semesters. Among applicants with the same number of subject semesters, places will be allocated by lot. A waiting list will be maintained and places re-allocated by lot as they become available.

Additional information

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Workload

300 h

Teaching cycle

Teaching cycle: Once a year, winter semester

Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Biophysics and Molecular Biotechnology			07-MS2BT-262-m01
Module coordinator		**Module offered by**	
holder of the Chair of Biotechnology and Biophysics		Faculty of Biology	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
10	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	Cannot be combined with 07-MS2BTB.	

Contents

This lecture provides a broad overview of biophysical techniques and their applications. The first part of the lecture discusses fundamental aspects of thermodynamics, kinetics and molecular interactions. The course then moves on to discuss biophysical methods that facilitate the investigation of individual cells down to the level of single molecules. Focus is on electromanipulation and dielectric spectroscopy of cells, biomembranes, electrophysiology, ion channels, protein folding, single-molecule fluorescence methods and high-resolution as well as dynamic microscopy.

Intended learning outcomes

Students will have acquired a knowledge of fundamental biophysical methods and their applications that will enable them to independently review relevant literature. In addition, they will have become acquainted with - or, where necessary, will be able to independently acquaint themselves with - biophysical mechanisms.

Courses (type, number of weekly contact hours, language — if other than German)

V (2) + S (1)
Module taught in: English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (30 to 60 minutes, including multiple choice questions) or
c) oral examination of one candidate each (30 to 60 minutes) or
d) oral examination in groups of up to 3 candidates (30 to 60 minutes)
Language of assessment: German and/or English

Allocation of places

MA Biochemie: 4
There is no limit to the number of participants for MA Biosciences students. Places are limited for MA Biochemistry students. Selection is based on academic progress (number of semesters completed); in case of a tie, places will be allocated by lottery; any places that become available after the initial registration period will be allocated by lottery.

Additional information

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Workload

300 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Literature seminar 1			08-MBC-LIT1-152-m01
Module coordinator			**Module offered by**
chairperson of examination committee Biochemie (Biochemistry)			Chair of Biochemistry
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
5	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

Students read assigned biochemistry-related publications on a particular topic in the life sciences and deliver presentations on those publications to their classmates. Those presentations will be followed by critical discussions of the relevant topics. Please contact the module coordinator in advance to find out if you can use this module in the Master's programme in Biochemistry.

Intended learning outcomes

Students have enhanced their ability to read and critically engage with current biochemistry-related literature in the field of the life sciences. They have enhanced their skills in the presentation and discussion of scientific information.

Courses (type, number of weekly contact hours, language — if other than German)

S (2)
Module taught in: German or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

presentation (20 to 40 minutes)
Language of assessment: German and/or English

Allocation of places

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Additional information

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Workload

150 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Single Cell Biology			03-98-SCB-192-m01
Module coordinator			**Module offered by**
Helmholtz Institute of RNA-based Infection Research Würzburg			Faculty of Medicine
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
5	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

The Single Cell Biology course is at the interface of genomics, bioinformatics, biology and pathology. It will give an introduction of the most recent technologies for single cell analysis and an overview of the application of single cell biology across the medical field (cancer, immunology, cardiovascular diseases, and infectious diseases). Practical components will allow the students to be familiarized with the basic tools to perform data analysis.

Intended learning outcomes

Students are familiar with fundamental concepts of single cell biology throughout the life sciences and they can apply basic procedures to analyze single cell data sets. They recognize the significance and areas of application of the methods for medical diagnostics and translational research.

Courses (type, number of weekly contact hours, language — if other than German)

V (1.5) + Ü (0.5)
Module taught in: English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 60 minutes)
Language of assessment: English
creditable for bonus

Allocation of places

M.Sc.Biomed: 15
M.Sc. Biochem: 15
M.Sc. Biowis: 10
Selection process: allocation by lot

Additional information

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Workload

150 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Compulsory Electives 2

(40 ECTS credits)

Choosing a focus area; this must be fully completed.

Focus Expert Key Qualifications (practice oriented)

(40 ECTS credits)

Subfield Research oriented Projects

(30 ECTS credits)

Module title			Abbreviation
Practical course - abroad 1			08-MBC-AP1-152-m01
Module coordinator			**Module offered by**
chairperson of examination committee Biochemie (Biochemistry)			Chair of Biochemistry
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
30	(not) successfully completed	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

Practical course to be completed at universities abroad. Students may complete this course in the context of exchange programmes such as Erasmus etc. The contents of the course should correspond to the contents of a lab course offered in the context of the Master's programme in Biochemistry (120 ECTS credits); please consult with the competent coordinator in advance.

Intended learning outcomes

Students are familiar with procedures and processes used at universities in countries other than Germany. They have acquired subject-specific skills as well as language and interpersonal skills.

Courses (type, number of weekly contact hours, language — if other than German)

P (0)

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) log (approx. 20 pages) or
b) oral examination of one candidate each (approx. 20 minutes) or
c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or
d) presentation/talk (approx. 15 to 30 minutes)
Language of assessment: German and/or English

Allocation of places

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Additional information

Duration of practical course: no less than 15 weeks.

Workload

900 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Practical course - abroad 2			08-MBC-AP2-152-m01
Module coordinator			**Module offered by**
chairperson of examination committee Biochemie (Biochemistry)			Chair of Biochemistry
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
15	(not) successfully completed	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

Practical course to be completed at universities abroad. Students may complete this course in the context of exchange programmes such as Erasmus etc. The contents of the course should correspond to the contents of a lab course offered in the context of the Master's programme in Biochemistry (120 ECTS credits); please consult with the competent coordinator in advance.

Intended learning outcomes

Students are familiar with procedures and processes used at universities in countries other than Germany. They have acquired subject-specific skills as well as language and interpersonal skills.

Courses (type, number of weekly contact hours, language — if other than German)

P (0)

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) log (approx. 20 pages) or
b) oral examination of one candidate each (approx. 20 minutes) or
c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or
d) presentation/talk (approx. 15 to 30 minutes)
Language of assessment: German and/or English

Allocation of places

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Additional information

Duration of practical course: no less than 8 weeks.

Workload

450 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Practical course - external 1			08-MBC-EP1-152-m01
Module coordinator			**Module offered by**
chairperson of examination committee Biochemie (Biochemistry)			Chair of Biochemistry
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
15	(not) successfully completed	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

Students complete a placement at a non-university research/diagnostic institution or a business. Contents to be determined by the host institution. The contents of the placement should correspond to the contents of a lab course offered in the context of the Master's programme in Biochemistry (180 ECTS credits); please consult with the competent coordinator in advance.

Intended learning outcomes

Students have become familiar with the structures of non-university research institutions and have developed skills which qualify them to work in their profession.

Courses (type, number of weekly contact hours, language — if other than German)

P (0)

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) log (approx. 20 pages) or
b) oral examination of one candidate each (approx. 20 minutes) or
c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or
d) presentation/talk (approx. 15 to 30 minutes)
Language of assessment: German and/or English

Allocation of places

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Additional information

Duration of practical course: no less than 8 weeks.

Workload

450 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Practical course - external 2			08-MBC-EP2-152-m01
Module coordinator		**Module offered by**	
chairperson of examination committee Biochemie (Biochemistry)		Chair of Biochemistry	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
15	(not) successfully completed	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

Students complete a placement at a non-university research/diagnostic institution or a business. Contents to be determined by the host institution. The contents of the placement should correspond to the contents of a lab course offered in the context of the Master's programme in Biochemistry (180 ECTS credits); please consult with the competent coordinator in advance.

Intended learning outcomes

Students have become familiar with the structures of non-university research institutions and have developed skills which qualify them to work in their profession.

Courses (type, number of weekly contact hours, language — if other than German)

P (0)

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) log (approx. 20 pages) or
b) oral examination of one candidate each (approx. 20 minutes) or
c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or
d) presentation/talk (approx. 15 to 30 minutes)
Language of assessment: German and/or English

Allocation of places

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Additional information

Duration of practical course: no less than 8 weeks.

Workload

450 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Practical lab course 1			08-MBC-LP1-152-m01
Module coordinator			**Module offered by**
chairperson of examination committee Biochemie (Biochemistry)			Chair of Biochemistry
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
15	(not) successfully completed	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

This lab course is based in a biochemistry and/or molecular biology research group at the University of Würzburg. Please consult with the competent coordinator in advance regarding contents to be covered. The course gives students the opportunity to actively engage with methods in biochemistry, molecular biology and/or bioinformatics. Students will be expected to write a lab report documenting their experiments and findings.

Intended learning outcomes

Students have consolidated and enhanced their proficiency in research methods. They have developed the ability to apply those methods to new problems and to determine whether they are suitable for those problems. They have learned how to document and discuss experimental procedures and findings according to best scientific practice.

Courses (type, number of weekly contact hours, language — if other than German)

P (20)

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) log (approx. 20 pages) or
b) oral examination of one candidate each (approx. 20 minutes) or
c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or
d) presentation/talk (approx. 15 to 30 minutes)
Language of assessment: German and/or English

Allocation of places

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Additional information

Duration of practical course: no less than 8 weeks.

Workload

450 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Practical lab course 2			08-MBC-LP2-152-m01
Module coordinator			**Module offered by**
chairperson of examination committee Biochemie (Biochemistry)			Chair of Biochemistry
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
15	(not) successfully completed	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

This lab course is based in a biochemistry and/or molecular biology research group at the University of Würzburg. Please consult with the competent coordinator in advance regarding contents to be covered. The course gives students the opportunity to actively engage with methods in biochemistry, molecular biology and/or bioinformatics. Students will be expected to write a lab report documenting their experiments and findings.

Intended learning outcomes

Students have consolidated and enhanced their proficiency in research methods. They have developed the ability to apply those methods to new problems and to determine whether they are suitable for those problems. They have learned how to document and discuss experimental procedures and findings according to best scientific practice.

Courses (type, number of weekly contact hours, language — if other than German)

P (20)

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) log (approx. 20 pages) or
b) oral examination of one candidate each (approx. 20 minutes) or
c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or
d) presentation/talk (approx. 15 to 30 minutes)
Language of assessment: German and/or English

Allocation of places

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Additional information

Duration of practical course: no less than 8 weeks.

Workload

450 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Practical lab course 3			08-MBC-LP3-152-m01
Module coordinator			**Module offered by**
chairperson of examination committee Biochemie (Biochemistry)			Chair of Biochemistry
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
10	(not) successfully completed	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

This lab course is based in a biochemistry and/or molecular biology research group at the University of Würzburg. Please consult with the competent coordinator in advance regarding contents to be covered. The course gives students the opportunity to actively engage with methods in biochemistry, molecular biology and/or bioinformatics. Students will be expected to write a lab report documenting their experiments and findings.

Intended learning outcomes

Students have consolidated and enhanced their proficiency in research methods. They have developed the ability to apply those methods to new problems and to determine whether they are suitable for those problems. They have learned how to document and discuss experimental procedures and findings according to best scientific practice.

Courses (type, number of weekly contact hours, language — if other than German)

P (16)

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) log (approx. 20 pages) or
b) oral examination of one candidate each (approx. 20 minutes) or
c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or
d) presentation/talk (approx. 15 to 30 minutes)
Language of assessment: German and/or English

Allocation of places

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Additional information

Duration of practical course: no less than 6 weeks.

Workload

300 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Practical lab course 4			08-MBC-LP4-152-m01
Module coordinator			**Module offered by**
chairperson of examination committee Biochemie (Biochemistry)			Chair of Biochemistry
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
10	(not) successfully completed	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

This lab course is based in a biochemistry and/or molecular biology research group at the University of Würzburg. Please consult with the competent coordinator in advance regarding contents to be covered. The course gives students the opportunity to actively engage with methods in biochemistry, molecular biology and/or bioinformatics. Students will be expected to write a lab report documenting their experiments and findings.

Intended learning outcomes

Students have consolidated and enhanced their proficiency in research methods. They have developed the ability to apply those methods to new problems and to determine whether they are suitable for those problems. They have learned how to document and discuss experimental procedures and findings according to best scientific practice.

Courses (type, number of weekly contact hours, language — if other than German)

P (16)

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) log (approx. 20 pages) or
b) oral examination of one candidate each (approx. 20 minutes) or
c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or
d) presentation/talk (approx. 15 to 30 minutes)
Language of assessment: German and/or English

Allocation of places

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Additional information

Duration of practical course: no less than 6 weeks.

Workload

300 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Practical lab course 5			08-MBC-LP5-152-m01
Module coordinator			**Module offered by**
chairperson of examination committee Biochemie (Biochemistry)			Chair of Biochemistry
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
5	(not) successfully completed	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

This lab course is based in a biochemistry and/or molecular biology research group at the University of Würzburg. Please consult with the competent coordinator in advance regarding contents to be covered. The course gives students the opportunity to actively engage with methods in biochemistry, molecular biology and/or bioinformatics. Students will be expected to write a lab report documenting their experiments and findings.

Intended learning outcomes

Students have consolidated and enhanced their proficiency in research methods. They have developed the ability to apply those methods to new problems and to determine whether they are suitable for those problems. They have learned how to document and discuss experimental procedures and findings according to best scientific practice.

Courses (type, number of weekly contact hours, language — if other than German)

P (8)

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) log (approx. 20 pages) or
b) oral examination of one candidate each (approx. 20 minutes) or
c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or
d) presentation/talk (approx. 15 to 30 minutes)
Language of assessment: German and/or English

Allocation of places

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Additional information

Duration of practical course: no less than 3 weeks.

Workload

150 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Practical lab course 6			08-MBC-LP6-152-m01
Module coordinator			**Module offered by**
chairperson of examination committee Biochemie (Biochemistry)			Chair of Biochemistry
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
5	(not) successfully completed	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

This lab course is based in a biochemistry and/or molecular biology research group at the University of Würzburg. Please consult with the competent coordinator in advance regarding contents to be covered. The course gives students the opportunity to actively engage with methods in biochemistry, molecular biology and/or bioinformatics. Students will be expected to write a lab report documenting their experiments and findings.

Intended learning outcomes

Students have consolidated and enhanced their proficiency in research methods. They have developed the ability to apply those methods to new problems and to determine whether they are suitable for those problems. They have learned how to document and discuss experimental procedures and findings according to best scientific practice.

Courses (type, number of weekly contact hours, language — if other than German)

P (8)

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) log (approx. 20 pages) or
b) oral examination of one candidate each (approx. 20 minutes) or
c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or
d) presentation/talk (approx. 15 to 30 minutes)
Language of assessment: German and/or English

Allocation of places

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Additional information

Duration of practical course: no less than 3 weeks.

Workload

150 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Scientific lecturing M2			08-MBC-WR2-152-m01
Module coordinator			**Module offered by**
chairperson of examination committee Biochemie (Biochemistry)			Chair of Biochemistry
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
5	(not) successfully completed	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

This module gives students the opportunity to teach a tutorial accompanying a lecture offered by the Faculty of Chemistry and Pharmacy and learn how to present and teach topics in an appropriate manner.

Intended learning outcomes

Students are able to teach students in earlier stages of their degrees and tailor their teaching to those students' needs.

Courses (type, number of weekly contact hours, language — if other than German)

T (0)

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Preparing and supervising study groups: assessment to be successfully completed (type and length of assessment to be specified at the beginning of the course)
Language of assessment: German and/or English

Allocation of places

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Additional information

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Workload

150 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Assistance in practical courses 2			08-MBC-AWA2-152-m01
Module coordinator			**Module offered by**
chairperson of examination committee Biochemie (Biochemistry)			Chair of Biochemistry
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
5	(not) successfully completed	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

This module gives students the opportunity to guide students in earlier stages of their degrees through a practical experiment and learn how to organise scientific experiments, perform those experiments in a responsible manner and instruct others in the lab.

Intended learning outcomes

Students are able to guide students in earlier stages of their degrees through practical experiments and have learned how to instruct others in the lab.

Courses (type, number of weekly contact hours, language — if other than German)

T (0)

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Preparing and supervising student lab courses: assessment to be successfully completed (type and length of assessment to be specified at the beginning of the course)
Language of assessment: German and/or English

Allocation of places

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Additional information

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Workload

150 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Subfield Completive Qualifications

(10 ECTS credits)

Module title			Abbreviation
Bioorganic Chemistry			08-SCM3-152-m01
Module coordinator		**Module offered by**	
lecturer of lecture "Bioorganische Chemie" (Bioorganic Chemistry)		Institute of Organic Chemistry	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
5	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

Bioorganic chemistry unites the central questions of organic chemistry, biochemistry, medicinal chemistry and spectroscopy with a focus on biomolecules. At the core of bioorganic chemistry is the synthesis and purposeful manipulation of biomolecules, such as nucleic acids, peptides, proteins, carbohydrates and lipids. This includes the framework of structure-function relationships and the fundamental understanding of biological mechanisms, to enable applications towards biomaterials, biosensing, bioimaging, clinical diagnostics and therapeutics.

Key concepts covered in the course are nucleic acid chemistry, peptide chemistry, carbohydrate chemistry, bioorthogonal reactions, molecular diversity, solid-phase synthesis, molecular recognition and interactions (ligand-receptor interactions, signal transduction)

Intended learning outcomes

The students will have a molecular understanding of the structure and reactivity of biomolecules. The students obtain knowledge of modern synthetic methods in bioorganic chemistry and can explain principles of molecular interactions and recognition mechanisms. They can describe modern aspects of nucleic acids, proteins, carbohydrates and lipids.

Courses (type, number of weekly contact hours, language — if other than German)

S (3)

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (approx. 45 to 90 minutes) or
b) oral examination of one candidate each (20 to 30 minutes) or
c) oral examination in groups of up to 3 candidates (15 to 30 minutes per candidate)
Language of assessment: German and/or English

Allocation of places

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Additional information

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Workload

150 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Bioinorganic Chemistry			08-ACM2-242-m01
Module coordinator		**Module offered by**	
lecturer of the seminar "Bioinorganic Chemistry"		Institute of Inorganic Chemistry	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
5	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

This module introduces students to the fundamental principles of bioinorganic chemistry (BIC). It discusses the methods of BIC, structures and effects of metalliferous enzymes and applications of BIC in the fields of diagnosis and therapy.

Intended learning outcomes

Students are able to describe the principles of, and methods in, BIC. They can explain the structure and effects of metalliferous enzymes and describe applications of BIC in biochemistry and medicine.

Courses (type, number of weekly contact hours, language — if other than German)

S (3)
Module taught in: German or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (approx. 45 to 90 minutes) or
b) oral examination of one candidate each (20 to 30 minutes) or
c) portfolio (approx. 30 hours total)
Language of assessment: German and/or English

Allocation of places

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Additional information

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Workload

150 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title	Abbreviation
Modern Aspects of Biological Chemistry	08-OCM-BIO-242-m01

Module coordinator	Module offered by
lecturer of the seminar "Modern Aspects of Biological Chemistry"	Institute of Organic Chemistry

ECTS	Method of grading	Only after succ. compl. of module(s)
5	numerical grade	--

Duration	Module level	Other prerequisites
1 semester	graduate	--

Contents

The course deals with advanced topics of biological chemistry that build on fundamental knowledge of organic chemistry, bioorganic chemistry, biochemistry and molecular biology. Key concepts in the course cover the chemistry of the genetic code, and methods to analyse and interfere with gene expression and secondary metabolism. We will cover genetic code expansion, including unnatural base pairs and unnatural amino acids, including their chemical synthesis and enzymatic incorporation. We will also cover combinatorial synthesis methods and directed evolution and display technologies. This includes in vitro selection and in vitro evolution of functional nucleic acids (aptamers, ribozymes, deoxyribozymes), mRNA display, phage display, directed evolution of proteins/enzymes, antibodies, nanobodies, sequencing methods, DNA/RNA origami and nanotechnology, as well as combinatorial polyketide synthesis and non-ribosomal peptide synthesis.

Intended learning outcomes

The students will have a detailed understanding of modern concepts in functional nucleic acids and engineered proteins, including their synthesis and analysis. They will be able to discuss a wide variety of relevant methods and explain chemical relationships at the molecular level with biochemical/biotechnological questions and apply them to corresponding problems. The students will be able to critically examine information and new developments in the field of biological chemistry.

Courses (type, number of weekly contact hours, language — if other than German)

S (3)
Module taught in: German or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (approx. 45 to 90 minutes) or
b) oral examination of one candidate each (20 to 30 minutes) or
c) oral examination in groups of up to 3 candidates (15 to 30 minutes per candidate)
Language of assessment: German and/or English

Allocation of places

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Additional information

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Workload

150 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Organo- and Biocatalysis			08-HKM1-152-m01
Module coordinator		**Module offered by**	
lecturer of the seminar "Organo- and Biokatalyse"		Faculty of Chemistry and Pharmacy	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
5	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

This module provides students with deeper insights into topics in organic compounds and enzymes in catalytic processes. Organocatalysis: enantioselective implementation, principles, green chemistry, substance classes and application areas. Biocatalysis: effects of enzymes in view of different aspects, especially regarding organic synthesis.

Intended learning outcomes

Students are able to categorise organocatalysts and explain their effects and areas of application. They can describe the structure and applications of enzymes in organic synthesis. They are able to mechanistically describe and analyse the effects of enzymes.

Courses (type, number of weekly contact hours, language — if other than German)

S (3)

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (approx. 45 to 90 minutes) or
b) oral examination of one candidate each (20 to 30 minutes) or
c) oral examination in groups of up to 3 candidates (15 to 30 minutes per candidate)
Language of assessment: German and/or English

Allocation of places

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Additional information

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Workload

150 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Bioinformatics			07-MS2BI-262-m01
Module coordinator		**Module offered by**	
holder of the Chair of Bioinformatics		Faculty of Biology	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
10	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	Cannot be combined with 07-MBI-B.	

Contents

Advances and current results of bioinformatics are explained and discussed, this includes results from genome and sequence analysis, protein domains and protein families, large-scale data analysis (e. g. net generation sequences, proteomics data), analysis of different functional RNAs (e. g. miRNAs, lncRNAs).

Intended learning outcomes

Understand recent results in bioinformatics. Discuss their implications. Have an advanced (Master) level knowledge of typical technologies and research questions in bioinformatics.

Courses (type, number of weekly contact hours, language — if other than German)

V (2) + S (1)
Module taught in: German and/or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (30 to 60 minutes, including multiple choice questions) or
c) oral examination of one candidate each (30 to 60 minutes) or
d) oral examination in groups of up to 3 candidates (30 to 60 minutes)
Language of assessment: German and/or English

Allocation of places

MA Biochemie: 24
There is no limit to the number of participants for MA Biosciences students. Places are limited for MA Biochemistry students. Selection is based on academic progress (number of semesters completed); in case of a tie, places will be allocated by lottery; any places that become available after the initial registration period will be allocated by lottery.

Additional information

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Workload

300 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Systems Biology			07-MS3S-261-m01
Module coordinator		**Module offered by**	
holder of the Chair of Bioinformatics		Faculty of Biology	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
10	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	Cannot be combined with 07-MS-B.	

Contents

Advances and current results of computational systems biology are explained and discussed, this includes results from functional genomics, dynamics of the transcriptome, of metabolism and metabolic networks as well as regulatory networks.

Intended learning outcomes

Understand recent results in systems biology. Discuss their implications. Have an advanced (Master) level knowledge of typical technologies and research questions of systems biology.

Courses (type, number of weekly contact hours, language — if other than German)

V (2) + S (1)
Module taught in: German and/or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (30 to 60 minutes, including multiple choice questions) or
c) oral examination of one candidate each (30 to 60 minutes) or
d) oral examination in groups of up to 3 candidates (30 to 60 minutes)
Language of assessment: German and/or English

Allocation of places

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Additional information

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Workload

300 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Methods in Life Sciences			07-MLS1-261-m01
Module coordinator		**Module offered by**	
degree programme coordinator Biologie (Biology)		Faculty of Biology	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
10	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	Cannot be combined with 07-MLS1B.	

Contents

Versioned molecular techniques, lipid research methods, microscopic methods, immunohistochemistry, mouse models and gene-knockout approaches, protein and molecular biology techniques, PCR, advanced protein biochemistry, methods in bioinformatics and computational biology.

Intended learning outcomes

Students are able to review and expand their knowledge of standard molecular techniques and are able to choose methods and techniques to design experiments in a specific research area.

Courses (type, number of weekly contact hours, language — if other than German)

V (3)
Module taught in: English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (30 to 60 minutes, including multiple choice questions) or
c) oral examination of one candidate each (30 to 60 minutes) or
d) oral examination in groups of up to 3 candidates (30 to 60 minutes)
Language of assessment: English

Allocation of places

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Additional information

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Workload

300 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Animal science and welfare			03-VTK-152-m01
Module coordinator		**Module offered by**	
Animal Welfare Officer of the University of Würzburg		Faculty of Medicine	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
3	(not) successfully completed	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	undergraduate	Regular attendance of practical course (as specified at the beginning of the course).	

Contents

Theoretical and practical basic knowledge of animal welfare legislation, animal welfare ethics and laboratory animal science.

Intended learning outcomes

Students have the expertise to carry out or participate in animal experiments according to the guidelines of FELASA (Cat. B).

Courses (type, number of weekly contact hours, language — if other than German)

V (2) + P (1)

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 90 minutes)

Allocation of places

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Additional information

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Workload

90 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title	Abbreviation
Current Topics in Ethics and Theory of Science	08-MBC-CTE-212-m01

Module coordinator	Module offered by
chairperson of examination committee Master Biochemie (Biochemistry)	Chair of Biochemistry

ECTS	Method of grading	Only after succ. compl. of module(s)
5	numerical grade	--

Duration	Module level	Other prerequisites
1 semester	graduate	--

Contents

This module is a platform for discussion of current philosophical issues regarding science and in particular life sciences and their application. Topics may range from practical ones, including political, societal or ethical issues, to more theoretical ones. Possible topics are, for example, ethical doubts about genome editing, science denial by conspiracy theories and politicians or the relation of faith and science. Participants are welcome to suggest topics and texts and the group will agree on an agenda in week 1.

Intended learning outcomes

Students can identify practical or theoretical philosophical questions that relate to the sciences. They have working knowledge allowing them to pursue a rational discussion.

Courses (type, number of weekly contact hours, language — if other than German)

0 (3)
Module taught in: German or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (approx. 45 to 90 minutes) or
b) term paper (8 to 12 pages) or
c) oral examination of one candidate each (20 to 30 minutes) or
d) oral examination in groups of up to 3 candidates (15 to 30 minutes per candidate) or
e) presentation (20 to 40 minutes)
Language of assessment: German and/or English
Assessment offered: Once a year, summer term

Allocation of places

Biochemie (Biochemistry), Master's: 30 places.
Places will be allocated according to the number of subject semesters. Among applicants with the same number of subject semesters, places will be allocated by lot. A waiting list will be maintained and places re-allocated by lot as they become available.

Additional information

Regular participation in the exercises (at least 80% attendance) is a prerequisite for participation in the exam.

Workload

150 h

Teaching cycle

Teaching cycle: every year, summer semester

Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Ethics of the Life Sciences			08-MBC-BE-212-m01
Module coordinator		**Module offered by**	
chairperson of examination committee Master Biochemie (Biochemistry)		Chair of Biochemistry	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
5	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

This module introduces the most important ethical topics that result from new findings and new technologies in the life sciences, such as synthetic biology or Crispr/Cas9. The course provides an overview of the major ethical theories, concepts and methods like technology assessment. The module consists of a lecture and a corresponding seminar.

Intended learning outcomes

Students have working knowledge about a set of basic ethical questions regarding the latest development in the life sciences. They are familiar with the key concepts, theories and methods including technology assessment.

Courses (type, number of weekly contact hours, language — if other than German)

V (2) + S (1)
Module taught in: German or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (approx. 45 to 90 minutes) or
b) term paper (8 to 12 pages) or
c) oral examination of one candidate each (20 to 30 minutes) or
d) oral examination in groups of up to 3 candidates (15 to 30 minutes per candidate) or
e) presentation (20 to 40 minutes)
Language of assessment: German and/or English
Assessment offered: Once a year, winter term

Allocation of places

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Additional information

Regular participation in the exercises (at least 80% attendance) is a prerequisite for participation in the exam.

Workload

150 h

Teaching cycle

Teaching cycle: every year, winter semester

Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Literature seminar 3b			08-MBC-LIT3b-212-m01
Module coordinator		**Module offered by**	
chairperson of examination committee Master Biochemie (Biochemistry)		Chair of Biochemistry	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
5	(not) successfully completed	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	May not be combined with 08-MBC-LIT3	

Contents

Students read assigned biochemistry-related publications on a particular topic in the life sciences and deliver presentations on those publications to their classmates. Those presentations will be followed by critical discussions of the relevant topics. Please contact the module coordinator in advance to find out if you can use this module in the Master's programme in Biochemistry.

Intended learning outcomes

Students have enhanced their ability to read and critically engage with current biochemistry-related literature in the field of the life sciences. They have enhanced their skills in the presentation and discussion of scientific information.

Courses (type, number of weekly contact hours, language — if other than German)

S (2)
Module taught in: German or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

presentation (20 to 40 minutes)
Language of assessment: German and/or English

Allocation of places

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Additional information

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Workload

150 h

Teaching cycle

Teaching cycle: winter semester and summer semester

Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Scientific lecturing M1			08-MBC-WR1-152-m01
Module coordinator			**Module offered by**
chairperson of examination committee Biochemie (Biochemistry)			Chair of Biochemistry
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
5	(not) successfully completed	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

This module gives students the opportunity to teach a tutorial accompanying a lecture offered by the Faculty of Chemistry and Pharmacy and learn how to present and teach topics in an appropriate manner.

Intended learning outcomes

Students are able to teach students in earlier stages of their degrees and tailor their teaching to those students' needs.

Courses (type, number of weekly contact hours, language — if other than German)

T (0)

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Preparing and supervising study groups, wrap-up report (approx. 2 pages)
Language of assessment: German and/or English

Allocation of places

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Additional information

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Workload

150 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Assistance in practical courses 1			08-MBC-AWA1-152-m01
Module coordinator			**Module offered by**
chairperson of examination committee Biochemie (Biochemistry)			Chair of Biochemistry
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
5	(not) successfully completed	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

This module gives students the opportunity to guide students in earlier stages of their degrees through a practical experiment and learn how to organise scientific experiments, perform those experiments in a responsible manner and instruct others in the lab.

Intended learning outcomes

Students are able to guide students in earlier stages of their degrees through practical experiments and have learned how to instruct others in the lab.

Courses (type, number of weekly contact hours, language — if other than German)

T (0)

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Preparing and supervising student lab courses, wrap-up report (approx. 1 page)
Language of assessment: German and/or English

Allocation of places

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Additional information

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Workload

150 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Literature seminar 3			08-MBC-LIT3-152-m01
Module coordinator			**Module offered by**
chairperson of examination committee Biochemie (Biochemistry)			Chair of Biochemistry
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
5	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

Students read assigned biochemistry-related publications on a particular topic in the life sciences and deliver presentations on those publications to their classmates. Those presentations will be followed by critical discussions of the relevant topics. Please contact the module coordinator in advance to find out if you can use this module in the Master's programme in Biochemistry.

Intended learning outcomes

Students have enhanced their ability to read and critically engage with current biochemistry-related literature in the field of the life sciences. They have enhanced their skills in the presentation and discussion of scientific information.

Courses (type, number of weekly contact hours, language — if other than German)

S (2)
Module taught in: German or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

presentation (20 to 40 minutes)
Language of assessment: German and/or English

Allocation of places

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Additional information

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Workload

150 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Focus - Expert Key Qualifications

(40 ECTS credits)

Subfield Research oriented Projects

(20 ECTS credits)

Module title			Abbreviation
Practical course - abroad 1			08-MBC-AP1-152-m01
Module coordinator		**Module offered by**	
chairperson of examination committee Biochemie (Biochemistry)		Chair of Biochemistry	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
30	(not) successfully completed	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

Practical course to be completed at universities abroad. Students may complete this course in the context of exchange programmes such as Erasmus etc. The contents of the course should correspond to the contents of a lab course offered in the context of the Master's programme in Biochemistry (120 ECTS credits); please consult with the competent coordinator in advance.

Intended learning outcomes

Students are familiar with procedures and processes used at universities in countries other than Germany. They have acquired subject-specific skills as well as language and interpersonal skills.

Courses (type, number of weekly contact hours, language — if other than German)

P (0)

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) log (approx. 20 pages) or
b) oral examination of one candidate each (approx. 20 minutes) or
c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or
d) presentation/talk (approx. 15 to 30 minutes)
Language of assessment: German and/or English

Allocation of places

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Additional information

Duration of practical course: no less than 15 weeks.

Workload

900 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Practical course - abroad 2			08-MBC-AP2-152-m01
Module coordinator			**Module offered by**
chairperson of examination committee Biochemie (Biochemistry)			Chair of Biochemistry
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
15	(not) successfully completed	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

Practical course to be completed at universities abroad. Students may complete this course in the context of exchange programmes such as Erasmus etc. The contents of the course should correspond to the contents of a lab course offered in the context of the Master's programme in Biochemistry (120 ECTS credits); please consult with the competent coordinator in advance.

Intended learning outcomes

Students are familiar with procedures and processes used at universities in countries other than Germany. They have acquired subject-specific skills as well as language and interpersonal skills.

Courses (type, number of weekly contact hours, language — if other than German)

P (0)

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) log (approx. 20 pages) or
b) oral examination of one candidate each (approx. 20 minutes) or
c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or
d) presentation/talk (approx. 15 to 30 minutes)
Language of assessment: German and/or English

Allocation of places

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Additional information

Duration of practical course: no less than 8 weeks.

Workload

450 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Practical course - external 1			08-MBC-EP1-152-m01
Module coordinator			**Module offered by**
chairperson of examination committee Biochemie (Biochemistry)			Chair of Biochemistry
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
15	(not) successfully completed	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

Students complete a placement at a non-university research/diagnostic institution or a business. Contents to be determined by the host institution. The contents of the placement should correspond to the contents of a lab course offered in the context of the Master's programme in Biochemistry (180 ECTS credits); please consult with the competent coordinator in advance.

Intended learning outcomes

Students have become familiar with the structures of non-university research institutions and have developed skills which qualify them to work in their profession.

Courses (type, number of weekly contact hours, language — if other than German)

P (0)

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) log (approx. 20 pages) or
b) oral examination of one candidate each (approx. 20 minutes) or
c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or
d) presentation/talk (approx. 15 to 30 minutes)
Language of assessment: German and/or English

Allocation of places

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Additional information

Duration of practical course: no less than 8 weeks.

Workload

450 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Practical course - external 2			08-MBC-EP2-152-m01
Module coordinator		**Module offered by**	
chairperson of examination committee Biochemie (Biochemistry)		Chair of Biochemistry	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
15	(not) successfully completed	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

Students complete a placement at a non-university research/diagnostic institution or a business. Contents to be determined by the host institution. The contents of the placement should correspond to the contents of a lab course offered in the context of the Master's programme in Biochemistry (180 ECTS credits); please consult with the competent coordinator in advance.

Intended learning outcomes

Students have become familiar with the structures of non-university research institutions and have developed skills which qualify them to work in their profession.

Courses (type, number of weekly contact hours, language — if other than German)

P (0)

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) log (approx. 20 pages) or
b) oral examination of one candidate each (approx. 20 minutes) or
c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or
d) presentation/talk (approx. 15 to 30 minutes)
Language of assessment: German and/or English

Allocation of places

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Additional information

Duration of practical course: no less than 8 weeks.

Workload

450 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Practical lab course 1			08-MBC-LP1-152-m01
Module coordinator			**Module offered by**
chairperson of examination committee Biochemie (Biochemistry)			Chair of Biochemistry
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
15	(not) successfully completed	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

This lab course is based in a biochemistry and/or molecular biology research group at the University of Würzburg. Please consult with the competent coordinator in advance regarding contents to be covered. The course gives students the opportunity to actively engage with methods in biochemistry, molecular biology and/or bioinformatics. Students will be expected to write a lab report documenting their experiments and findings.

Intended learning outcomes

Students have consolidated and enhanced their proficiency in research methods. They have developed the ability to apply those methods to new problems and to determine whether they are suitable for those problems. They have learned how to document and discuss experimental procedures and findings according to best scientific practice.

Courses (type, number of weekly contact hours, language — if other than German)

P (20)

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) log (approx. 20 pages) or
b) oral examination of one candidate each (approx. 20 minutes) or
c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or
d) presentation/talk (approx. 15 to 30 minutes)
Language of assessment: German and/or English

Allocation of places

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Additional information

Duration of practical course: no less than 8 weeks.

Workload

450 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Practical lab course 2			08-MBC-LP2-152-m01
Module coordinator			**Module offered by**
chairperson of examination committee Biochemie (Biochemistry)			Chair of Biochemistry
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
15	(not) successfully completed	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

This lab course is based in a biochemistry and/or molecular biology research group at the University of Würzburg. Please consult with the competent coordinator in advance regarding contents to be covered. The course gives students the opportunity to actively engage with methods in biochemistry, molecular biology and/or bioinformatics. Students will be expected to write a lab report documenting their experiments and findings.

Intended learning outcomes

Students have consolidated and enhanced their proficiency in research methods. They have developed the ability to apply those methods to new problems and to determine whether they are suitable for those problems. They have learned how to document and discuss experimental procedures and findings according to best scientific practice.

Courses (type, number of weekly contact hours, language — if other than German)

P (20)

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) log (approx. 20 pages) or
b) oral examination of one candidate each (approx. 20 minutes) or
c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or
d) presentation/talk (approx. 15 to 30 minutes)
Language of assessment: German and/or English

Allocation of places

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Additional information

Duration of practical course: no less than 8 weeks.

Workload

450 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Practical lab course 3			08-MBC-LP3-152-m01
Module coordinator			**Module offered by**
chairperson of examination committee Biochemie (Biochemistry)			Chair of Biochemistry
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
10	(not) successfully completed	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

This lab course is based in a biochemistry and/or molecular biology research group at the University of Würzburg. Please consult with the competent coordinator in advance regarding contents to be covered. The course gives students the opportunity to actively engage with methods in biochemistry, molecular biology and/or bioinformatics. Students will be expected to write a lab report documenting their experiments and findings.

Intended learning outcomes

Students have consolidated and enhanced their proficiency in research methods. They have developed the ability to apply those methods to new problems and to determine whether they are suitable for those problems. They have learned how to document and discuss experimental procedures and findings according to best scientific practice.

Courses (type, number of weekly contact hours, language — if other than German)

P (16)

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) log (approx. 20 pages) or
b) oral examination of one candidate each (approx. 20 minutes) or
c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or
d) presentation/talk (approx. 15 to 30 minutes)
Language of assessment: German and/or English

Allocation of places

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Additional information

Duration of practical course: no less than 6 weeks.

Workload

300 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Practical lab course 4			08-MBC-LP4-152-m01
Module coordinator			**Module offered by**
chairperson of examination committee Biochemie (Biochemistry)			Chair of Biochemistry
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
10	(not) successfully completed	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

This lab course is based in a biochemistry and/or molecular biology research group at the University of Würzburg. Please consult with the competent coordinator in advance regarding contents to be covered. The course gives students the opportunity to actively engage with methods in biochemistry, molecular biology and/or bioinformatics. Students will be expected to write a lab report documenting their experiments and findings.

Intended learning outcomes

Students have consolidated and enhanced their proficiency in research methods. They have developed the ability to apply those methods to new problems and to determine whether they are suitable for those problems. They have learned how to document and discuss experimental procedures and findings according to best scientific practice.

Courses (type, number of weekly contact hours, language — if other than German)

P (16)

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) log (approx. 20 pages) or
b) oral examination of one candidate each (approx. 20 minutes) or
c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or
d) presentation/talk (approx. 15 to 30 minutes)
Language of assessment: German and/or English

Allocation of places

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Additional information

Duration of practical course: no less than 6 weeks.

Workload

300 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Practical lab course 5			08-MBC-LP5-152-m01
Module coordinator			**Module offered by**
chairperson of examination committee Biochemie (Biochemistry)			Chair of Biochemistry
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
5	(not) successfully completed	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

This lab course is based in a biochemistry and/or molecular biology research group at the University of Würzburg. Please consult with the competent coordinator in advance regarding contents to be covered. The course gives students the opportunity to actively engage with methods in biochemistry, molecular biology and/or bioinformatics. Students will be expected to write a lab report documenting their experiments and findings.

Intended learning outcomes

Students have consolidated and enhanced their proficiency in research methods. They have developed the ability to apply those methods to new problems and to determine whether they are suitable for those problems. They have learned how to document and discuss experimental procedures and findings according to best scientific practice.

Courses (type, number of weekly contact hours, language — if other than German)

P (8)

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) log (approx. 20 pages) or
b) oral examination of one candidate each (approx. 20 minutes) or
c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or
d) presentation/talk (approx. 15 to 30 minutes)
Language of assessment: German and/or English

Allocation of places

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Additional information

Duration of practical course: no less than 3 weeks.

Workload

150 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Practical lab course 6			08-MBC-LP6-152-m01
Module coordinator			**Module offered by**
chairperson of examination committee Biochemie (Biochemistry)			Chair of Biochemistry
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
5	(not) successfully completed	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

This lab course is based in a biochemistry and/or molecular biology research group at the University of Würzburg. Please consult with the competent coordinator in advance regarding contents to be covered. The course gives students the opportunity to actively engage with methods in biochemistry, molecular biology and/or bioinformatics. Students will be expected to write a lab report documenting their experiments and findings.

Intended learning outcomes

Students have consolidated and enhanced their proficiency in research methods. They have developed the ability to apply those methods to new problems and to determine whether they are suitable for those problems. They have learned how to document and discuss experimental procedures and findings according to best scientific practice.

Courses (type, number of weekly contact hours, language — if other than German)

P (8)

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) log (approx. 20 pages) or
b) oral examination of one candidate each (approx. 20 minutes) or
c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or
d) presentation/talk (approx. 15 to 30 minutes)
Language of assessment: German and/or English

Allocation of places

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Additional information

Duration of practical course: no less than 3 weeks.

Workload

150 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Scientific lecturing M2			08-MBC-WR2-152-m01
Module coordinator			**Module offered by**
chairperson of examination committee Biochemie (Biochemistry)			Chair of Biochemistry
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
5	(not) successfully completed	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

This module gives students the opportunity to teach a tutorial accompanying a lecture offered by the Faculty of Chemistry and Pharmacy and learn how to present and teach topics in an appropriate manner.

Intended learning outcomes

Students are able to teach students in earlier stages of their degrees and tailor their teaching to those students' needs.

Courses (type, number of weekly contact hours, language — if other than German)

T (0)

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Preparing and supervising study groups: assessment to be successfully completed (type and length of assessment to be specified at the beginning of the course)
Language of assessment: German and/or English

Allocation of places

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Additional information

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Workload

150 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Assistance in practical courses 2			08-MBC-AWA2-152-m01
Module coordinator			**Module offered by**
chairperson of examination committee Biochemie (Biochemistry)			Chair of Biochemistry
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
5	(not) successfully completed	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

This module gives students the opportunity to guide students in earlier stages of their degrees through a practical experiment and learn how to organise scientific experiments, perform those experiments in a responsible manner and instruct others in the lab.

Intended learning outcomes

Students are able to guide students in earlier stages of their degrees through practical experiments and have learned how to instruct others in the lab.

Courses (type, number of weekly contact hours, language — if other than German)

T (0)

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Preparing and supervising student lab courses: assessment to be successfully completed (type and length of assessment to be specified at the beginning of the course)
Language of assessment: German and/or English

Allocation of places

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Additional information

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Workload

150 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Subfield Completive Qualifications

(20 ECTS credits)

Module title			Abbreviation
Bioorganic Chemistry			08-SCM3-152-m01
Module coordinator		**Module offered by**	
lecturer of lecture "Bioorganische Chemie" (Bioorganic Chemistry)		Institute of Organic Chemistry	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
5	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

Bioorganic chemistry unites the central questions of organic chemistry, biochemistry, medicinal chemistry and spectroscopy with a focus on biomolecules. At the core of bioorganic chemistry is the synthesis and purposeful manipulation of biomolecules, such as nucleic acids, peptides, proteins, carbohydrates and lipids. This includes the framework of structure-function relationships and the fundamental understanding of biological mechanisms, to enable applications towards biomaterials, biosensing, bioimaging, clinical diagnostics and therapeutics.

Key concepts covered in the course are nucleic acid chemistry, peptide chemistry, carbohydrate chemistry, bioorthogonal reactions, molecular diversity, solid-phase synthesis, molecular recognition and interactions (ligand-receptor interactions, signal transduction)

Intended learning outcomes

The students will have a molecular understanding of the structure and reactivity of biomolecules. The students obtain knowledge of modern synthetic methods in bioorganic chemistry and can explain principles of molecular interactions and recognition mechanisms. They can describe modern aspects of nucleic acids, proteins, carbohydrates and lipids.

Courses (type, number of weekly contact hours, language — if other than German)

S (3)

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (approx. 45 to 90 minutes) or
b) oral examination of one candidate each (20 to 30 minutes) or
c) oral examination in groups of up to 3 candidates (15 to 30 minutes per candidate)
Language of assessment: German and/or English

Allocation of places

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Additional information

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Workload

150 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Bioinorganic Chemistry			08-ACM2-242-m01
Module coordinator		**Module offered by**	
lecturer of the seminar "Bioinorganic Chemistry"		Institute of Inorganic Chemistry	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
5	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

This module introduces students to the fundamental principles of bioinorganic chemistry (BIC). It discusses the methods of BIC, structures and effects of metalliferous enzymes and applications of BIC in the fields of diagnosis and therapy.

Intended learning outcomes

Students are able to describe the principles of, and methods in, BIC. They can explain the structure and effects of metalliferous enzymes and describe applications of BIC in biochemistry and medicine.

Courses (type, number of weekly contact hours, language — if other than German)

S (3)
Module taught in: German or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (approx. 45 to 90 minutes) or
b) oral examination of one candidate each (20 to 30 minutes) or
c) portfolio (approx. 30 hours total)
Language of assessment: German and/or English

Allocation of places

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Additional information

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Workload

150 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title	Abbreviation
Modern Aspects of Biological Chemistry	08-OCM-BIO-242-m01

Module coordinator	Module offered by
lecturer of the seminar "Modern Aspects of Biological Chemistry"	Institute of Organic Chemistry

ECTS	Method of grading	Only after succ. compl. of module(s)
5	numerical grade	--

Duration	Module level	Other prerequisites
1 semester	graduate	--

Contents

The course deals with advanced topics of biological chemistry that build on fundamental knowledge of organic chemistry, bioorganic chemistry, biochemistry and molecular biology. Key concepts in the course cover the chemistry of the genetic code, and methods to analyse and interfere with gene expression and secondary metabolism. We will cover genetic code expansion, including unnatural base pairs and unnatural amino acids, including their chemical synthesis and enzymatic incorporation. We will also cover combinatorial synthesis methods and directed evolution and display technologies. This includes in vitro selection and in vitro evolution of functional nucleic acids (aptamers, ribozymes, deoxyribozymes), mRNA display, phage display, directed evolution of proteins/enzymes, antibodies, nanobodies, sequencing methods, DNA/RNA origami and nanotechnology, as well as combinatorial polyketide synthesis and non-ribosomal peptide synthesis.

Intended learning outcomes

The students will have a detailed understanding of modern concepts in functional nucleic acids and engineered proteins, including their synthesis and analysis. They will be able to discuss a wide variety of relevant methods and explain chemical relationships at the molecular level with biochemical/biotechnological questions and apply them to corresponding problems. The students will be able to critically examine information and new developments in the field of biological chemistry.

Courses (type, number of weekly contact hours, language — if other than German)

S (3)
Module taught in: German or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (approx. 45 to 90 minutes) or
b) oral examination of one candidate each (20 to 30 minutes) or
c) oral examination in groups of up to 3 candidates (15 to 30 minutes per candidate)
Language of assessment: German and/or English

Allocation of places

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Additional information

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Workload

150 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Organo- and Biocatalysis			08-HKM1-152-m01
Module coordinator		**Module offered by**	
lecturer of the seminar "Organo- and Biokatalyse"		Faculty of Chemistry and Pharmacy	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
5	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

This module provides students with deeper insights into topics in organic compounds and enzymes in catalytic processes. Organocatalysis: enantioselective implementation, principles, green chemistry, substance classes and application areas. Biocatalysis: effects of enzymes in view of different aspects, especially regarding organic synthesis.

Intended learning outcomes

Students are able to categorise organocatalysts and explain their effects and areas of application. They can describe the structure and applications of enzymes in organic synthesis. They are able to mechanistically describe and analyse the effects of enzymes.

Courses (type, number of weekly contact hours, language — if other than German)

S (3)

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (approx. 45 to 90 minutes) or
b) oral examination of one candidate each (20 to 30 minutes) or
c) oral examination in groups of up to 3 candidates (15 to 30 minutes per candidate)
Language of assessment: German and/or English

Allocation of places

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Additional information

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Workload

150 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Human genetics			03-MS2HG-152-m01
Module coordinator		**Module offered by**	
holder of the Chair of of Human Genetics		Faculty of Medicine	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
10	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
2 semester	graduate	--	

Contents

This module will discuss current topics in human genetics.

Intended learning outcomes

Students have developed the ability to understand relevant questions in human genetics and to discuss these in detail.

Courses (type, number of weekly contact hours, language — if other than German)

V (2) + S (2)
Module taught in: German or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (approx. 45 to 90 minutes) or
b) oral examination of one candidate each (20 to 30 minutes) or
c) oral examination in groups of up to 3 candidates (15 to 30 minutes per candidate)
Language of assessment: German and/or English

Allocation of places

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Additional information

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Workload

300 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Bioinformatics			07-MS2BI-262-m01
Module coordinator		**Module offered by**	
holder of the Chair of Bioinformatics		Faculty of Biology	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
10	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	Cannot be combined with 07-MBI-B.	

Contents

Advances and current results of bioinformatics are explained and discussed, this includes results from genome and sequence analysis, protein domains and protein families, large-scale data analysis (e. g. net generation sequences, proteomics data), analysis of different functional RNAs (e. g. miRNAs, lncRNAs).

Intended learning outcomes

Understand recent results in bioinformatics. Discuss their implications. Have an advanced (Master) level knowledge of typical technologies and research questions in bioinformatics.

Courses (type, number of weekly contact hours, language — if other than German)

V (2) + S (1)
Module taught in: German and/or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (30 to 60 minutes, including multiple choice questions) or
c) oral examination of one candidate each (30 to 60 minutes) or
d) oral examination in groups of up to 3 candidates (30 to 60 minutes)
Language of assessment: German and/or English

Allocation of places

MA Biochemie: 24
There is no limit to the number of participants for MA Biosciences students. Places are limited for MA Biochemistry students. Selection is based on academic progress (number of semesters completed); in case of a tie, places will be allocated by lottery; any places that become available after the initial registration period will be allocated by lottery.

Additional information

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Workload

300 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Systems Biology			07-MS3S-261-m01
Module coordinator		**Module offered by**	
holder of the Chair of Bioinformatics		Faculty of Biology	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
10	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	Cannot be combined with 07-MS-B.	

Contents

Advances and current results of computational systems biology are explained and discussed, this includes results from functional genomics, dynamics of the transcriptome, of metabolism and metabolic networks as well as regulatory networks.

Intended learning outcomes

Understand recent results in systems biology. Discuss their implications. Have an advanced (Master) level knowledge of typical technologies and research questions of systems biology.

Courses (type, number of weekly contact hours, language — if other than German)

V (2) + S (1)
Module taught in: German and/or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (30 to 60 minutes, including multiple choice questions) or
c) oral examination of one candidate each (30 to 60 minutes) or
d) oral examination in groups of up to 3 candidates (30 to 60 minutes)
Language of assessment: German and/or English

Allocation of places

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Additional information

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Workload

300 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Methods in Life Sciences			07-MLS1-261-m01
Module coordinator		**Module offered by**	
degree programme coordinator Biologie (Biology)		Faculty of Biology	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
10	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	Cannot be combined with 07-MLS1B.	

Contents

Versioned molecular techniques, lipid research methods, microscopic methods, immunohistochemistry, mouse models and gene-knockout approaches, protein and molecular biology techniques, PCR, advanced protein biochemistry, methods in bioinformatics and computational biology.

Intended learning outcomes

Students are able to review and expand their knowledge of standard molecular techniques and are able to choose methods and techniques to design experiments in a specific research area.

Courses (type, number of weekly contact hours, language — if other than German)

V (3)
Module taught in: English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (30 to 60 minutes, including multiple choice questions) or
c) oral examination of one candidate each (30 to 60 minutes) or
d) oral examination in groups of up to 3 candidates (30 to 60 minutes)
Language of assessment: English

Allocation of places

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Additional information

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Workload

300 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Animal science and welfare			03-VTK-152-m01
Module coordinator		**Module offered by**	
Animal Welfare Officer of the University of Würzburg		Faculty of Medicine	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
3	(not) successfully completed	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	undergraduate	Regular attendance of practical course (as specified at the beginning of the course).	

Contents

Theoretical and practical basic knowledge of animal welfare legislation, animal welfare ethics and laboratory animal science.

Intended learning outcomes

Students have the expertise to carry out or participate in animal experiments according to the guidelines of FELASA (Cat. B).

Courses (type, number of weekly contact hours, language — if other than German)

V (2) + P (1)

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 90 minutes)

Allocation of places

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Additional information

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Workload

90 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title	Abbreviation
Current Topics in Ethics and Theory of Science	08-MBC-CTE-212-m01

Module coordinator	Module offered by
chairperson of examination committee Master Biochemie (Biochemistry)	Chair of Biochemistry

ECTS	Method of grading	Only after succ. compl. of module(s)
5	numerical grade	--

Duration	Module level	Other prerequisites
1 semester	graduate	--

Contents

This module is a platform for discussion of current philosophical issues regarding science and in particular life sciences and their application. Topics may range from practical ones, including political, societal or ethical issues, to more theoretical ones. Possible topics are, for example, ethical doubts about genome editing, science denial by conspiracy theories and politicians or the relation of faith and science. Participants are welcome to suggest topics and texts and the group will agree on an agenda in week 1.

Intended learning outcomes

Students can identify practical or theoretical philosophical questions that relate to the sciences. They have working knowledge allowing them to pursue a rational discussion.

Courses (type, number of weekly contact hours, language — if other than German)

0 (3)
Module taught in: German or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (approx. 45 to 90 minutes) or
b) term paper (8 to 12 pages) or
c) oral examination of one candidate each (20 to 30 minutes) or
d) oral examination in groups of up to 3 candidates (15 to 30 minutes per candidate) or
e) presentation (20 to 40 minutes)
Language of assessment: German and/or English
Assessment offered: Once a year, summer term

Allocation of places

Biochemie (Biochemistry), Master's: 30 places.
Places will be allocated according to the number of subject semesters. Among applicants with the same number of subject semesters, places will be allocated by lot. A waiting list will be maintained and places re-allocated by lot as they become available.

Additional information

Regular participation in the exercises (at least 80% attendance) is a prerequisite for participation in the exam.

Workload

150 h

Teaching cycle

Teaching cycle: every year, summer semester

Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Ethics of the Life Sciences			08-MBC-BE-212-m01
Module coordinator		**Module offered by**	
chairperson of examination committee Master Biochemie (Biochemistry)		Chair of Biochemistry	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
5	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

This module introduces the most important ethical topics that result from new findings and new technologies in the life sciences, such as synthetic biology or Crispr/Cas9. The course provides an overview of the major ethical theories, concepts and methods like technology assessment. The module consists of a lecture and a corresponding seminar.

Intended learning outcomes

Students have working knowledge about a set of basic ethical questions regarding the latest development in the life sciences. They are familiar with the key concepts, theories and methods including technology assessment.

Courses (type, number of weekly contact hours, language — if other than German)

V (2) + S (1)
Module taught in: German or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (approx. 45 to 90 minutes) or
b) term paper (8 to 12 pages) or
c) oral examination of one candidate each (20 to 30 minutes) or
d) oral examination in groups of up to 3 candidates (15 to 30 minutes per candidate) or
e) presentation (20 to 40 minutes)
Language of assessment: German and/or English
Assessment offered: Once a year, winter term

Allocation of places

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Additional information

Regular participation in the exercises (at least 80% attendance) is a prerequisite for participation in the exam.

Workload

150 h

Teaching cycle

Teaching cycle: every year, winter semester

Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Literature seminar 3b			08-MBC-LIT3b-212-m01
Module coordinator		**Module offered by**	
chairperson of examination committee Master Biochemie (Biochemistry)		Chair of Biochemistry	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
5	(not) successfully completed	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	May not be combined with 08-MBC-LIT3	

Contents

Students read assigned biochemistry-related publications on a particular topic in the life sciences and deliver presentations on those publications to their classmates. Those presentations will be followed by critical discussions of the relevant topics. Please contact the module coordinator in advance to find out if you can use this module in the Master's programme in Biochemistry.

Intended learning outcomes

Students have enhanced their ability to read and critically engage with current biochemistry-related literature in the field of the life sciences. They have enhanced their skills in the presentation and discussion of scientific information.

Courses (type, number of weekly contact hours, language — if other than German)

S (2)
Module taught in: German or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

presentation (20 to 40 minutes)
Language of assessment: German and/or English

Allocation of places

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Additional information

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Workload

150 h

Teaching cycle

Teaching cycle: winter semester and summer semester

Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Assistance in practical courses 1			08-MBC-AWA1-152-m01
Module coordinator			**Module offered by**
chairperson of examination committee Biochemie (Biochemistry)			Chair of Biochemistry
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
5	(not) successfully completed	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

This module gives students the opportunity to guide students in earlier stages of their degrees through a practical experiment and learn how to organise scientific experiments, perform those experiments in a responsible manner and instruct others in the lab.

Intended learning outcomes

Students are able to guide students in earlier stages of their degrees through practical experiments and have learned how to instruct others in the lab.

Courses (type, number of weekly contact hours, language — if other than German)

T (0)

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Preparing and supervising student lab courses, wrap-up report (approx. 1 page)
Language of assessment: German and/or English

Allocation of places

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Additional information

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Workload

150 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Literature seminar 3			08-MBC-LIT3-152-m01
Module coordinator			**Module offered by**
chairperson of examination committee Biochemie (Biochemistry)			Chair of Biochemistry
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
5	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

Students read assigned biochemistry-related publications on a particular topic in the life sciences and deliver presentations on those publications to their classmates. Those presentations will be followed by critical discussions of the relevant topics. Please contact the module coordinator in advance to find out if you can use this module in the Master's programme in Biochemistry.

Intended learning outcomes

Students have enhanced their ability to read and critically engage with current biochemistry-related literature in the field of the life sciences. They have enhanced their skills in the presentation and discussion of scientific information.

Courses (type, number of weekly contact hours, language — if other than German)

S (2)
Module taught in: German or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

presentation (20 to 40 minutes)
Language of assessment: German and/or English

Allocation of places

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Additional information

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Workload

150 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Tumor Genetics			03-MBC-TG-161-m01
Module coordinator		**Module offered by**	
holder of the Professorship Human Genetics at Institute for Human Genetics		Institute of Human Genetics	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
5	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

Basics on human genetics (inheritance patterns, mutation types, etc.), hereditary cancer (breast & ovarian cancer, HNPCC, FAP, etc.), cancer syndromes, tumor cytogenetics, animal models in cancer genetics, genetic techniques (NGS, genome engineering, etc.)

Intended learning outcomes

The students acquired broad knowledge in the field of tumor genetics. Exemplify pathomechanisms in hereditary cancer. Name and illustrate genetic methods. Apply the acquired knowledge to scientific questions in the field of tumor genetics. Independent preparation and presentation of scientific articles. Acquire the ability to critically discuss latest developments in tumor genetics.

Courses (type, number of weekly contact hours, language — if other than German)

V (1) + S (1)
Module taught in: English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (approx. 45 to 90 minutes) or
b) log (20 to 30 pages) or
c) oral examination of one candidate each (20 to 30 minutes) or
d) oral examination in groups of up to 3 candidates (15 to 30 minutes per candidate) or
e) presentation (20 to 40 minutes)
Language of assessment: German and/or English

Allocation of places

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Additional information

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Workload

150 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Focus - Expert Key Qualifications (project oriented)

(40 ECTS credits)

Subfield Project attendant Modules

(30 ECTS credits)

Module title			Abbreviation
Special lectures 1			08-MBC-FTSV1-152-m01
Module coordinator			**Module offered by**
chairperson of examination committee Biochemie (Biochemistry)			Chair of Biochemistry
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
5	(not) successfully completed	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	Please consult with degree programme coordinator in advance.	

Contents

This module gives students the opportunity to attend a lecture discussing a topic that is relevant to the field they have selected as their focus. The module equips students with advanced knowledge in the natural sciences that is related to their field. The lecture may be offered by the University of Würzburg or by external institutions. Decision on credit transfer to be made by examination committee.

Intended learning outcomes

Students have developed an improved scientific knowledge and have thus enhanced their specific qualifications. They have acquired additional expertise that will help them specialise in their field.

Courses (type, number of weekly contact hours, language — if other than German)

V (2)
Module taught in: German or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (approx. 45 to 90 minutes) or
b) log (20 to 30 pages) or
c) oral examination of one candidate each (20 to 30 minutes) or
d) oral examination in groups of up to 3 candidates (15 to 30 minutes per candidate) or
e) presentation (20 to 40 minutes)
Language of assessment: German and/or English

Allocation of places

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Additional information

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Workload

150 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Special lectures 2			08-MBC-FTSV2-152-m01
Module coordinator			**Module offered by**
chairperson of examination committee Biochemie (Biochemistry)			Chair of Biochemistry
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
5	(not) successfully completed	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	Please consult with degree programme coordinator in advance.	

Contents

This module gives students the opportunity to attend a lecture discussing a topic that is relevant to the field they have selected as their focus. The module equips students with advanced knowledge in the natural sciences that is related to their field. The lecture may be offered by the University of Würzburg or by external institutions. Decision on credit transfer to be made by examination committee.

Intended learning outcomes

Students have developed an improved scientific knowledge and have thus enhanced their specific qualifications. They have acquired additional expertise that will help them specialise in their field.

Courses (type, number of weekly contact hours, language — if other than German)

V (2)
Module taught in: German or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (approx. 45 to 90 minutes) or
b) log (20 to 30 pages) or
c) oral examination of one candidate each (20 to 30 minutes) or
d) oral examination in groups of up to 3 candidates (15 to 30 minutes per candidate) or
e) presentation (20 to 40 minutes)
Language of assessment: German and/or English

Allocation of places

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Additional information

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Workload

150 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Conference participation with poster presentation 1			08-MBC-FTKP1-152-m01
Module coordinator			**Module offered by**
chairperson of examination committee Biochemie (Biochemistry)			Chair of Biochemistry
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
5	(not) successfully completed	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	Please consult with degree programme coordinator in advance.	

Contents

This module gives students the opportunity to attend a national or international conference covering a topic that is relevant to the field they have selected as their focus and to present their own findings in poster format. Decision on credit transfer to be made by examination committee.

Intended learning outcomes

Students gain a wider overview of recent findings and developments in the field they have selected as their focus. They have the opportunity to meet other researchers working in the field. They have the opportunity to enhance their ability to reflect critically on their own work, present it to the scientific community and defend it against criticism.

Courses (type, number of weekly contact hours, language — if other than German)

R (0)
Module taught in: German or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Poster (1 page)
Language of assessment: German and/or English

Allocation of places

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Additional information

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Workload

150 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Conference participation with poster presentation 2			08-MBC-FTKP2-152-m01
Module coordinator		**Module offered by**	
chairperson of examination committee Biochemie (Biochemistry)		Chair of Biochemistry	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
5	(not) successfully completed	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	Please consult with degree programme coordinator in advance.	

Contents

This module gives students the opportunity to attend a national or international conference covering a topic that is relevant to the field they have selected as their focus and to present their own findings in poster format. Decision on credit transfer to be made by examination committee.

Intended learning outcomes

Students gain a wider overview of recent findings and developments in the field they have selected as their focus. They have the opportunity to meet other researchers working in the field. They have the opportunity to enhance their ability to reflect critically on their own work, present it to the scientific community and defend it against criticism.

Courses (type, number of weekly contact hours, language — if other than German)

R (0)
Module taught in: German or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Poster (1 page)
Language of assessment: German and/or English

Allocation of places

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Additional information

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Workload

150 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Conference participation with lecture 1			08-MBC-FTKV1-152-m01
Module coordinator			**Module offered by**
chairperson of examination committee Biochemie (Biochemistry)			Chair of Biochemistry
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
10	(not) successfully completed	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	Please consult with degree programme coordinator in advance.	

Contents

This module gives students the opportunity to attend a national or international conference covering a topic that is relevant to the field they have selected as their focus and to deliver a presentation on their own findings. Decision on credit transfer to be made by examination committee.

Intended learning outcomes

Students gain a wider overview of recent findings and developments in the field they have selected as their focus. They have the opportunity to meet other researchers working in the field. They have the opportunity to enhance their ability to reflect critically on their own work, present it to the scientific community and defend it against criticism.

Courses (type, number of weekly contact hours, language — if other than German)

R (0)
Module taught in: German or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

presentation (20 to 40 minutes)
Language of assessment: German and/or English

Allocation of places

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Additional information

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Workload

300 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Conference participation with lecture 2			08-MBC-FTKV2-152-m01
Module coordinator			**Module offered by**
chairperson of examination committee Biochemie (Biochemistry)			Chair of Biochemistry
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
10	(not) successfully completed	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	Please consult with degree programme coordinator in advance.	

Contents

This module gives students the opportunity to attend a national or international conference covering a topic that is relevant to the field they have selected as their focus and to deliver a presentation on their own findings. Decision on credit transfer to be made by examination committee.

Intended learning outcomes

Students gain a wider overview of recent findings and developments in the field they have selected as their focus. They have the opportunity to meet other researchers working in the field. They have the opportunity to enhance their ability to reflect critically on their own work, present it to the scientific community and defend it against criticism.

Courses (type, number of weekly contact hours, language — if other than German)

R (0)
Module taught in: German or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

presentation (20 to 40 minutes)
Language of assessment: German and/or English

Allocation of places

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Additional information

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Workload

300 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Excursion 1			08-MBC-FTEX1-152-m01
Module coordinator			**Module offered by**
chairperson of examination committee Biochemie (Biochemistry)			Chair of Biochemistry
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
5	(not) successfully completed	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	Please consult with degree programme coordinator in advance.	

Contents

This module gives students the opportunity to participate in a field trip that is related to a topic that is relevant to the field they have selected as their focus. The module equips students with advanced knowledge in the natural sciences that is related to their field. The module may be offered by the University of Würzburg or by external institutions. Decision on credit transfer to be made by examination committee.

Intended learning outcomes

Students have developed an improved scientific knowledge and have thus enhanced their specific qualifications. They have acquired additional expertise that will help them specialise in their field.

Courses (type, number of weekly contact hours, language — if other than German)

E (1)
Module taught in: German or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (approx. 45 to 90 minutes) or
b) log (20 to 30 pages) or
c) oral examination of one candidate each (20 to 30 minutes) or
d) oral examination in groups of up to 3 candidates (15 to 30 minutes per candidate) or
e) presentation (20 to 40 minutes)
Language of assessment: German and/or English

Allocation of places

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Additional information

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Workload

150 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Excursion 2			08-MBC-FTEX2-152-m01
Module coordinator		**Module offered by**	
chairperson of examination committee Biochemie (Biochemistry)		Chair of Biochemistry	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
5	(not) successfully completed	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	Please consult with degree programme coordinator in advance.	

Contents

This module gives students the opportunity to participate in a field trip that is related to a topic that is relevant to the field they have selected as their focus. The module equips students with advanced knowledge in the natural sciences that is related to their field. The module may be offered by the University of Würzburg or by external institutions. Decision on credit transfer to be made by examination committee.

Intended learning outcomes

Students have developed an improved scientific knowledge and have thus enhanced their specific qualifications. They have acquired additional expertise that will help them specialise in their field.

Courses (type, number of weekly contact hours, language — if other than German)

E (1)
Module taught in: German or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (approx. 45 to 90 minutes) or
b) log (20 to 30 pages) or
c) oral examination of one candidate each (20 to 30 minutes) or
d) oral examination in groups of up to 3 candidates (15 to 30 minutes per candidate) or
e) presentation (20 to 40 minutes)
Language of assessment: German and/or English

Allocation of places

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Additional information

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Workload

150 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Seminar 1			08-MBC-FTSE1-152-m01
Module coordinator			**Module offered by**
chairperson of examination committee Biochemie (Biochemistry)			Chair of Biochemistry
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
5	(not) successfully completed	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	Please consult with degree programme coordinator in advance.	

Contents

This module gives students the opportunity to attend a seminar exploring a topic that is relevant to the field they have selected as their focus. The module enhances and consolidates the students' knowledge of the field and topic covered. The seminar may be offered by the University of Würzburg or by external institutions. Decision on credit transfer to be made by examination committee.

Intended learning outcomes

Students gain a wider overview of recent findings and developments in the field they have selected as their focus. They have acquired additional expertise that will help them specialise in their field.

Courses (type, number of weekly contact hours, language — if other than German)

S (2)
Module taught in: German or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (approx. 45 to 90 minutes) or
b) log (20 to 30 pages) or
c) oral examination of one candidate each (20 to 30 minutes) or
d) oral examination in groups of up to 3 candidates (15 to 30 minutes per candidate) or
e) presentation (20 to 40 minutes)
Language of assessment: German and/or English

Allocation of places

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Additional information

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Workload

150 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Seminar 2			08-MBC-FTSE2-152-m01
Module coordinator			**Module offered by**
chairperson of examination committee Biochemie (Biochemistry)			Chair of Biochemistry
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
5	(not) successfully completed	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	Please consult with degree programme coordinator in advance.	

Contents

This module gives students the opportunity to attend a seminar exploring a topic that is relevant to the field they have selected as their focus. The module enhances and consolidates the students' knowledge of the field and topic covered. The seminar may be offered by the University of Würzburg or by external institutions. Decision on credit transfer to be made by examination committee.

Intended learning outcomes

Students gain a wider overview of recent findings and developments in the field they have selected as their focus. They have acquired additional expertise that will help them specialise in their field.

Courses (type, number of weekly contact hours, language — if other than German)

S (2)
Module taught in: German or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (approx. 45 to 90 minutes) or
b) log (20 to 30 pages) or
c) oral examination of one candidate each (20 to 30 minutes) or
d) oral examination in groups of up to 3 candidates (15 to 30 minutes per candidate) or
e) presentation (20 to 40 minutes)
Language of assessment: German and/or English

Allocation of places

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Additional information

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Workload

150 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Seminar 3			08-MBC-FTSE3-152-m01
Module coordinator			**Module offered by**
chairperson of examination committee Biochemie (Biochemistry)			Chair of Biochemistry
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
5	(not) successfully completed	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	Please consult with degree programme coordinator in advance.	

Contents

This module gives students the opportunity to attend a seminar exploring a topic that is relevant to the field they have selected as their focus. The module enhances and consolidates the students' knowledge of the field and topic covered. The seminar may be offered by the University of Würzburg or by external institutions. Decision on credit transfer to be made by examination committee.

Intended learning outcomes

Students gain a wider overview of recent findings and developments in the field they have selected as their focus. They have acquired additional expertise that will help them specialise in their field.

Courses (type, number of weekly contact hours, language — if other than German)

S (2)
Module taught in: German or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (approx. 45 to 90 minutes) or
b) log (20 to 30 pages) or
c) oral examination of one candidate each (20 to 30 minutes) or
d) oral examination in groups of up to 3 candidates (15 to 30 minutes per candidate) or
e) presentation (20 to 40 minutes)
Language of assessment: German and/or English

Allocation of places

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Additional information

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Workload

150 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Workshop 1			08-MBC-FTWS1-152-m01
Module coordinator			**Module offered by**
chairperson of examination committee Biochemie (Biochemistry)			Chair of Biochemistry
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
5	(not) successfully completed	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	Please consult with degree programme coordinator in advance.	

Contents

This module gives students the opportunity to attend a workshop covering a topic that is relevant to the field they have selected as their focus. The module equips students with advanced methodological skills and advanced knowledge in the natural sciences that is related to their field. The workshop may be offered by the University of Würzburg or by external institutions. Decision on credit transfer to be made by examination committee.

Intended learning outcomes

Students have developed an improved scientific knowledge as well as enhanced methodological skills and have thus enhanced their specific qualifications. They have developed additional skills that will help them specialise in their field.

Courses (type, number of weekly contact hours, language — if other than German)

R (0)
Module taught in: German or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Wrap-up report (approx. 2 pages)
Language of assessment: German and/or English

Allocation of places

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Additional information

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Workload

150 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Workshop 2			08-MBC-FTWS2-152-m01
Module coordinator			**Module offered by**
chairperson of examination committee Biochemie (Biochemistry)			Chair of Biochemistry
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
5	(not) successfully completed	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	Please consult with degree programme coordinator in advance.	

Contents

This module gives students the opportunity to attend a workshop covering a topic that is relevant to the field they have selected as their focus. The module equips students with advanced methodological skills and advanced knowledge in the natural sciences that is related to their field. The workshop may be offered by the University of Würzburg or by external institutions. Decision on credit transfer to be made by examination committee.

Intended learning outcomes

Students have developed an improved scientific knowledge as well as enhanced methodological skills and have thus enhanced their specific qualifications. They have developed additional skills that will help them specialise in their field.

Courses (type, number of weekly contact hours, language — if other than German)

R (0)
Module taught in: German or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Wrap-up report (approx. 2 pages)
Language of assessment: German and/or English

Allocation of places

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Additional information

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Workload

150 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Workshop 3			08-MBC-FTWS3-152-m01
Module coordinator			**Module offered by**
chairperson of examination committee Biochemie (Biochemistry)			Chair of Biochemistry
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
5	(not) successfully completed	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	Please consult with degree programme coordinator in advance.	

Contents

This module gives students the opportunity to attend a workshop covering a topic that is relevant to the field they have selected as their focus. The module equips students with advanced methodological skills and advanced knowledge in the natural sciences that is related to their field. The workshop may be offered by the University of Würzburg or by external institutions. Decision on credit transfer to be made by examination committee.

Intended learning outcomes

Students have developed an improved scientific knowledge as well as enhanced methodological skills and have thus enhanced their specific qualifications. They have developed additional skills that will help them specialise in their field.

Courses (type, number of weekly contact hours, language — if other than German)

R (0)
Module taught in: German or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Wrap-up report (approx. 2 pages)
Language of assessment: German and/or English

Allocation of places

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Additional information

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Workload

150 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Assistance in practical courses 1			08-MBC-FTPB1-152-m01
Module coordinator			**Module offered by**
chairperson of examination committee Biochemie (Biochemistry)			Chair of Biochemistry
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
5	(not) successfully completed	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

This module gives students the opportunity to guide students in earlier stages of their degrees through a practical experiment and learn how to organise scientific experiments, perform those experiments in a responsible manner and instruct others in the lab.

Intended learning outcomes

Students are able to guide students in earlier stages of their degrees through practical experiments and have learned how to instruct others in the lab.

Courses (type, number of weekly contact hours, language — if other than German)

T (0)
Module taught in: German or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Preparing and supervising student lab courses, wrap-up report (approx. 1 page)
Language of assessment: German and/or English

Allocation of places

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Additional information

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Workload

150 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Assistance in practical courses 2			08-MBC-FTPB2-152-m01
Module coordinator			**Module offered by**
chairperson of examination committee Biochemie (Biochemistry)			Chair of Biochemistry
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
5	(not) successfully completed	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

This module gives students the opportunity to guide students in earlier stages of their degrees through a practical experiment and learn how to organise scientific experiments, perform those experiments in a responsible manner and instruct others in the lab.

Intended learning outcomes

Students are able to guide students in earlier stages of their degrees through practical experiments and have learned how to instruct others in the lab.

Courses (type, number of weekly contact hours, language — if other than German)

T (0)
Module taught in: German or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Preparing and supervising student lab courses, wrap-up report (approx. 1 page)
Language of assessment: German and/or English

Allocation of places

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Additional information

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Workload

150 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Subfield Completive Qualifications

(10 ECTS credits)

Module title			Abbreviation
Bioorganic Chemistry			08-SCM3-152-m01
Module coordinator		**Module offered by**	
lecturer of lecture "Bioorganische Chemie" (Bioorganic Chemistry)		Institute of Organic Chemistry	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
5	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

Bioorganic chemistry unites the central questions of organic chemistry, biochemistry, medicinal chemistry and spectroscopy with a focus on biomolecules. At the core of bioorganic chemistry is the synthesis and purposeful manipulation of biomolecules, such as nucleic acids, peptides, proteins, carbohydrates and lipids. This includes the framework of structure-function relationships and the fundamental understanding of biological mechanisms, to enable applications towards biomaterials, biosensing, bioimaging, clinical diagnostics and therapeutics.

Key concepts covered in the course are nucleic acid chemistry, peptide chemistry, carbohydrate chemistry, bioorthogonal reactions, molecular diversity, solid-phase synthesis, molecular recognition and interactions (ligand-receptor interactions, signal transduction)

Intended learning outcomes

The students will have a molecular understanding of the structure and reactivity of biomolecules. The students obtain knowledge of modern synthetic methods in bioorganic chemistry and can explain principles of molecular interactions and recognition mechanisms. They can describe modern aspects of nucleic acids, proteins, carbohydrates and lipids.

Courses (type, number of weekly contact hours, language — if other than German)

S (3)

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (approx. 45 to 90 minutes) or
b) oral examination of one candidate each (20 to 30 minutes) or
c) oral examination in groups of up to 3 candidates (15 to 30 minutes per candidate)
Language of assessment: German and/or English

Allocation of places

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Additional information

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Workload

150 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Bioinorganic Chemistry			08-ACM2-242-m01
Module coordinator		**Module offered by**	
lecturer of the seminar "Bioinorganic Chemistry"		Institute of Inorganic Chemistry	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
5	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

This module introduces students to the fundamental principles of bioinorganic chemistry (BIC). It discusses the methods of BIC, structures and effects of metalliferous enzymes and applications of BIC in the fields of diagnosis and therapy.

Intended learning outcomes

Students are able to describe the principles of, and methods in, BIC. They can explain the structure and effects of metalliferous enzymes and describe applications of BIC in biochemistry and medicine.

Courses (type, number of weekly contact hours, language — if other than German)

S (3)
Module taught in: German or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (approx. 45 to 90 minutes) or
b) oral examination of one candidate each (20 to 30 minutes) or
c) portfolio (approx. 30 hours total)
Language of assessment: German and/or English

Allocation of places

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Additional information

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Workload

150 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title	Abbreviation
Modern Aspects of Biological Chemistry	08-OCM-BIO-242-m01

Module coordinator	Module offered by
lecturer of the seminar "Modern Aspects of Biological Chemistry"	Institute of Organic Chemistry

ECTS	Method of grading	Only after succ. compl. of module(s)
5	numerical grade	--

Duration	Module level	Other prerequisites
1 semester	graduate	--

Contents

The course deals with advanced topics of biological chemistry that build on fundamental knowledge of organic chemistry, bioorganic chemistry, biochemistry and molecular biology. Key concepts in the course cover the chemistry of the genetic code, and methods to analyse and interfere with gene expression and secondary metabolism. We will cover genetic code expansion, including unnatural base pairs and unnatural amino acids, including their chemical synthesis and enzymatic incorporation. We will also cover combinatorial synthesis methods and directed evolution and display technologies. This includes in vitro selection and in vitro evolution of functional nucleic acids (aptamers, ribozymes, deoxyribozymes), mRNA display, phage display, directed evolution of proteins/enzymes, antibodies, nanobodies, sequencing methods, DNA/RNA origami and nanotechnology, as well as combinatorial polyketide synthesis and non-ribosomal peptide synthesis.

Intended learning outcomes

The students will have a detailed understanding of modern concepts in functional nucleic acids and engineered proteins, including their synthesis and analysis. They will be able to discuss a wide variety of relevant methods and explain chemical relationships at the molecular level with biochemical/biotechnological questions and apply them to corresponding problems. The students will be able to critically examine information and new developments in the field of biological chemistry.

Courses (type, number of weekly contact hours, language — if other than German)

S (3)
Module taught in: German or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (approx. 45 to 90 minutes) or
b) oral examination of one candidate each (20 to 30 minutes) or
c) oral examination in groups of up to 3 candidates (15 to 30 minutes per candidate)
Language of assessment: German and/or English

Allocation of places

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Additional information

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Workload

150 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Organo- and Biocatalysis			08-HKM1-152-m01
Module coordinator		**Module offered by**	
lecturer of the seminar "Organo- and Biokatalyse"		Faculty of Chemistry and Pharmacy	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
5	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

This module provides students with deeper insights into topics in organic compounds and enzymes in catalytic processes. Organocatalysis: enantioselective implementation, principles, green chemistry, substance classes and application areas. Biocatalysis: effects of enzymes in view of different aspects, especially regarding organic synthesis.

Intended learning outcomes

Students are able to categorise organocatalysts and explain their effects and areas of application. They can describe the structure and applications of enzymes in organic synthesis. They are able to mechanistically describe and analyse the effects of enzymes.

Courses (type, number of weekly contact hours, language — if other than German)

S (3)

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (approx. 45 to 90 minutes) or
b) oral examination of one candidate each (20 to 30 minutes) or
c) oral examination in groups of up to 3 candidates (15 to 30 minutes per candidate)
Language of assessment: German and/or English

Allocation of places

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Additional information

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Workload

150 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Bioinformatics			07-MS2BI-262-m01
Module coordinator		**Module offered by**	
holder of the Chair of Bioinformatics		Faculty of Biology	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
10	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	Cannot be combined with 07-MBI-B.	

Contents

Advances and current results of bioinformatics are explained and discussed, this includes results from genome and sequence analysis, protein domains and protein families, large-scale data analysis (e. g. net generation sequences, proteomics data), analysis of different functional RNAs (e. g. miRNAs, lncRNAs).

Intended learning outcomes

Understand recent results in bioinformatics. Discuss their implications. Have an advanced (Master) level knowledge of typical technologies and research questions in bioinformatics.

Courses (type, number of weekly contact hours, language — if other than German)

V (2) + S (1)
Module taught in: German and/or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (30 to 60 minutes, including multiple choice questions) or
c) oral examination of one candidate each (30 to 60 minutes) or
d) oral examination in groups of up to 3 candidates (30 to 60 minutes)
Language of assessment: German and/or English

Allocation of places

MA Biochemie: 24
There is no limit to the number of participants for MA Biosciences students. Places are limited for MA Biochemistry students. Selection is based on academic progress (number of semesters completed); in case of a tie, places will be allocated by lottery; any places that become available after the initial registration period will be allocated by lottery.

Additional information

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Workload

300 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Systems Biology			07-MS3S-261-m01
Module coordinator		**Module offered by**	
holder of the Chair of Bioinformatics		Faculty of Biology	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
10	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	Cannot be combined with 07-MS-B.	

Contents

Advances and current results of computational systems biology are explained and discussed, this includes results from functional genomics, dynamics of the transcriptome, of metabolism and metabolic networks as well as regulatory networks.

Intended learning outcomes

Understand recent results in systems biology. Discuss their implications. Have an advanced (Master) level knowledge of typical technologies and research questions of systems biology.

Courses (type, number of weekly contact hours, language — if other than German)

V (2) + S (1)
Module taught in: German and/or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (30 to 60 minutes, including multiple choice questions) or
c) oral examination of one candidate each (30 to 60 minutes) or
d) oral examination in groups of up to 3 candidates (30 to 60 minutes)
Language of assessment: German and/or English

Allocation of places

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Additional information

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Workload

300 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Methods in Life Sciences			07-MLS1-261-m01
Module coordinator		**Module offered by**	
degree programme coordinator Biologie (Biology)		Faculty of Biology	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
10	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	Cannot be combined with 07-MLS1B.	

Contents

Versioned molecular techniques, lipid research methods, microscopic methods, immunohistochemistry, mouse models and gene-knockout approaches, protein and molecular biology techniques, PCR, advanced protein biochemistry, methods in bioinformatics and computational biology.

Intended learning outcomes

Students are able to review and expand their knowledge of standard molecular techniques and are able to choose methods and techniques to design experiments in a specific research area.

Courses (type, number of weekly contact hours, language — if other than German)

V (3)
Module taught in: English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (30 to 60 minutes, including multiple choice questions) or
c) oral examination of one candidate each (30 to 60 minutes) or
d) oral examination in groups of up to 3 candidates (30 to 60 minutes)
Language of assessment: English

Allocation of places

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Additional information

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Workload

300 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Animal science and welfare			03-VTK-152-m01
Module coordinator		**Module offered by**	
Animal Welfare Officer of the University of Würzburg		Faculty of Medicine	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
3	(not) successfully completed	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	undergraduate	Regular attendance of practical course (as specified at the beginning of the course).	

Contents

Theoretical and practical basic knowledge of animal welfare legislation, animal welfare ethics and laboratory animal science.

Intended learning outcomes

Students have the expertise to carry out or participate in animal experiments according to the guidelines of FELASA (Cat. B).

Courses (type, number of weekly contact hours, language — if other than German)

V (2) + P (1)

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 90 minutes)

Allocation of places

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Additional information

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Workload

90 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title	Abbreviation
Current Topics in Ethics and Theory of Science	08-MBC-CTE-212-m01

Module coordinator	Module offered by
chairperson of examination committee Master Biochemie (Biochemistry)	Chair of Biochemistry

ECTS	Method of grading	Only after succ. compl. of module(s)
5	numerical grade	--

Duration	Module level	Other prerequisites
1 semester	graduate	--

Contents

This module is a platform for discussion of current philosophical issues regarding science and in particular life sciences and their application. Topics may range from practical ones, including political, societal or ethical issues, to more theoretical ones. Possible topics are, for example, ethical doubts about genome editing, science denial by conspiracy theories and politicians or the relation of faith and science. Participants are welcome to suggest topics and texts and the group will agree on an agenda in week 1.

Intended learning outcomes

Students can identify practical or theoretical philosophical questions that relate to the sciences. They have working knowledge allowing them to pursue a rational discussion.

Courses (type, number of weekly contact hours, language — if other than German)

0 (3)
Module taught in: German or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (approx. 45 to 90 minutes) or
b) term paper (8 to 12 pages) or
c) oral examination of one candidate each (20 to 30 minutes) or
d) oral examination in groups of up to 3 candidates (15 to 30 minutes per candidate) or
e) presentation (20 to 40 minutes)
Language of assessment: German and/or English
Assessment offered: Once a year, summer term

Allocation of places

Biochemie (Biochemistry), Master's: 30 places.
Places will be allocated according to the number of subject semesters. Among applicants with the same number of subject semesters, places will be allocated by lot. A waiting list will be maintained and places re-allocated by lot as they become available.

Additional information

Regular participation in the exercises (at least 80% attendance) is a prerequisite for participation in the exam.

Workload

150 h

Teaching cycle

Teaching cycle: every year, summer semester

Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Ethics of the Life Sciences			08-MBC-BE-212-m01
Module coordinator		**Module offered by**	
chairperson of examination committee Master Biochemie (Biochemistry)		Chair of Biochemistry	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
5	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

This module introduces the most important ethical topics that result from new findings and new technologies in the life sciences, such as synthetic biology or Crispr/Cas9. The course provides an overview of the major ethical theories, concepts and methods like technology assessment. The module consists of a lecture and a corresponding seminar.

Intended learning outcomes

Students have working knowledge about a set of basic ethical questions regarding the latest development in the life sciences. They are familiar with the key concepts, theories and methods including technology assessment.

Courses (type, number of weekly contact hours, language — if other than German)

V (2) + S (1)
Module taught in: German or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (approx. 45 to 90 minutes) or
b) term paper (8 to 12 pages) or
c) oral examination of one candidate each (20 to 30 minutes) or
d) oral examination in groups of up to 3 candidates (15 to 30 minutes per candidate) or
e) presentation (20 to 40 minutes)
Language of assessment: German and/or English
Assessment offered: Once a year, winter term

Allocation of places

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Additional information

Regular participation in the exercises (at least 80% attendance) is a prerequisite for participation in the exam.

Workload

150 h

Teaching cycle

Teaching cycle: every year, winter semester

Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Literature seminar 3b			08-MBC-LIT3b-212-m01
Module coordinator			**Module offered by**
chairperson of examination committee Master Biochemie (Biochemistry)			Chair of Biochemistry
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
5	(not) successfully completed	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	May not be combined with 08-MBC-LIT3	

Contents

Students read assigned biochemistry-related publications on a particular topic in the life sciences and deliver presentations on those publications to their classmates. Those presentations will be followed by critical discussions of the relevant topics. Please contact the module coordinator in advance to find out if you can use this module in the Master's programme in Biochemistry.

Intended learning outcomes

Students have enhanced their ability to read and critically engage with current biochemistry-related literature in the field of the life sciences. They have enhanced their skills in the presentation and discussion of scientific information.

Courses (type, number of weekly contact hours, language — if other than German)

S (2)
Module taught in: German or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

presentation (20 to 40 minutes)
Language of assessment: German and/or English

Allocation of places

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Additional information

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Workload

150 h

Teaching cycle

Teaching cycle: winter semester and summer semester

Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Scientific lecturing M1			08-MBC-WR1-152-m01
Module coordinator			**Module offered by**
chairperson of examination committee Biochemie (Biochemistry)			Chair of Biochemistry
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
5	(not) successfully completed	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

This module gives students the opportunity to teach a tutorial accompanying a lecture offered by the Faculty of Chemistry and Pharmacy and learn how to present and teach topics in an appropriate manner.

Intended learning outcomes

Students are able to teach students in earlier stages of their degrees and tailor their teaching to those students' needs.

Courses (type, number of weekly contact hours, language — if other than German)

T (0)

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Preparing and supervising study groups, wrap-up report (approx. 2 pages)
Language of assessment: German and/or English

Allocation of places

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Additional information

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Workload

150 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Assistance in practical courses 1			08-MBC-AWA1-152-m01
Module coordinator			**Module offered by**
chairperson of examination committee Biochemie (Biochemistry)			Chair of Biochemistry
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
5	(not) successfully completed	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

This module gives students the opportunity to guide students in earlier stages of their degrees through a practical experiment and learn how to organise scientific experiments, perform those experiments in a responsible manner and instruct others in the lab.

Intended learning outcomes

Students are able to guide students in earlier stages of their degrees through practical experiments and have learned how to instruct others in the lab.

Courses (type, number of weekly contact hours, language — if other than German)

T (0)

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Preparing and supervising student lab courses, wrap-up report (approx. 1 page)
Language of assessment: German and/or English

Allocation of places

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Additional information

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Workload

150 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Literature seminar 3			08-MBC-LIT3-152-m01
Module coordinator			**Module offered by**
chairperson of examination committee Biochemie (Biochemistry)			Chair of Biochemistry
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
5	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

Students read assigned biochemistry-related publications on a particular topic in the life sciences and deliver presentations on those publications to their classmates. Those presentations will be followed by critical discussions of the relevant topics. Please contact the module coordinator in advance to find out if you can use this module in the Master's programme in Biochemistry.

Intended learning outcomes

Students have enhanced their ability to read and critically engage with current biochemistry-related literature in the field of the life sciences. They have enhanced their skills in the presentation and discussion of scientific information.

Courses (type, number of weekly contact hours, language — if other than German)

S (2)
Module taught in: German or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

presentation (20 to 40 minutes)
Language of assessment: German and/or English

Allocation of places

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Additional information

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Workload

150 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Thesis Area

(30 ECTS credits)

Module title			Abbreviation
Master-Thesis			08-MBC-MA-152-m01
Module coordinator			**Module offered by**
chairperson of examination committee Biochemie (Biochemistry)			Chair of Biochemistry
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
25	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

This module gives students the opportunity to research and write on a defined problem within a given time frame and using the scientific methods they have learned during the programme.

Intended learning outcomes

Students are able to familiarise themselves with the current state of research on a particular topic with the help of scientific literature. They are able to conduct research on a defined problem/topic adhering to the principles of good scientific practice, to write up, evaluate and interpret their findings as well as to situate those findings within the context of scientific literature.

Courses (type, number of weekly contact hours, language — if other than German)

No courses assigned to module

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Master's thesis (approx. 60 pages)
Language of assessment: German or English

Allocation of places

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Additional information

Time to complete: 6 months.

Workload

750 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title			Abbreviation
Final Colloquium			08-MBC-KOLL-152-m01
Module coordinator			**Module offered by**
chairperson of examination committee Biochemie (Biochemistry)			Chair of Biochemistry
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
5	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

Students deliver a presentation on the findings of their Master's thesis and critically discuss them with their audience.

Intended learning outcomes

Students are able to present the findings of their projects. They can defend their choice of experimental methods, their findings as well as the evaluation and interpretation of those findings in a scientific discussion.

Courses (type, number of weekly contact hours, language — if other than German)

K (0)

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

final colloquium (approx. 45 minutes)
Language of assessment: German and/or English

Allocation of places

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Additional information

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Workload

150 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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