



Module Catalogue

for the Subject

Biomedicine

as a Master's with 1 major
with the degree "Master of Science"
(120 ECTS credits)

Examination regulations version: 2015
Responsible: Faculty of Medicine
Responsible: Faculty of Biology

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The subject is divided into

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Learning Outcomes

German contents and learning outcome available but not translated yet.

Wissenschaftliche Befähigung

- Die Absolventen/-innen können Experimente eigenständig durchführen, analysieren, interpretieren und die Ergebnisse fachlich diskutieren.
- Die Absolventen/-innen sind in der Lage, Problemanalysen durchzuführen und Problemlösungen zu entwickeln.
- Die Absolventen/-innen sind in der Lage, Fachliteratur zu verstehen, in den naturwissenschaftlichen Kontext einzuordnen und kritisch zu hinterfragen.
- Die Absolventen/-innen erlangen ein vertieftes Wissen in den Bereichen der Biomedizin sowie die Fähigkeit, Grundlagenwissen anzuwenden.
- Die Absolventen/-innen erlernen experimentelle Methoden der Biochemie, Bioinformatik, Molekularbiologie sowie Bioanalytik und lernen die Arbeitsweise mit verschiedensten forschungsrelevanten Modellorganismen kennen.
- Die Absolventen/-innen besitzen die Fähigkeit, theoretisch erlerntes Wissen in der Praxis anzuwenden, eigenständig Experimente zu entwickeln, durchzuführen und zu interpretieren sowie die Ergebnisse vor Fachpublikum zu präsentieren.
- Die Absolventen/-innen lernen, organisiert und strukturiert den naturwissenschaftlichen Grundprinzipien folgend zu arbeiten und praktische Experimente in Schriftform und als Präsentation darzustellen.
- Die Absolventen/-innen sind in der Lage, theoretisches und praktisches Wissen zu vermitteln.

Befähigung, eine qualifizierte Erwerbstätigkeit aufzunehmen

- Die Absolventen/-innen sind in der Lage, theoretisches Wissen in der Praxis anzuwenden.
- Die Absolventen/-innen können Probleme erkennen und dazu eigene Lösungsansätze entwickeln.
- Die Absolventen/-innen können ihr naturwissenschaftliches Wissen und die Praxisarbeit in Schriftform und Präsentationen darstellen und konstruktive Kritik umsetzen.
- Die Absolventen/-innen sind in der Lage, Englisch als Wissenschaftssprache anzuwenden.
- Die Absolventen/-innen sind in der Lage, wissenschaftlich eigenständig zu arbeiten.
- Die Absolventen/-innen können praktische Aufgaben durchführen, analysieren, interpretieren und anschließend diskutieren.

Befähigung zum gesellschaftlichen Engagement

- Die Absolventen/-innen sind in der Lage, naturwissenschaftliche Fachliteratur sowie die neuesten Entwicklungen der Forschung kritisch zu reflektieren, in den aktuellen Kontext einzuordnen sowie Auswirkungen auf gesellschaftliche Bereiche wie Umwelt, Wirtschaft etc. zu erkennen und zu diskutieren.
- Die Absolventen/-innen entwickeln die Motivation und Fähigkeit, eigene Ideen in partizipative Prozesse einzubringen und zu diskutieren.
- Die Absolventen/-innen können ihre erworbenen Kompetenzen anwenden.

Persönlichkeitsentwicklung

- Die Absolventen/-innen kennen die Regeln guten wissenschaftlichen Arbeitens und befolgen diese.
- Die Absolventen/-innen erlernen Eigenorganisation und Zeitmanagement.
- Die Absolventen/-innen erlernen die Fähigkeit, im Team zu kommunizieren und zu arbeiten.
- Die Absolventen/-innen erlernen das selbstständige wissenschaftliche Arbeiten sowie die Fähigkeit ihre Ergebnisse zu reflektieren, mit anderen Positionen zu vergleichen und zu diskutieren.
- Die Absolventen/-innen übernehmen die Verantwortung für ihr Handeln.

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)):

13-Jul-2015 (2015-13) except for mandatory electives 03-98-FBM-172, 08-MBC-EMV-172 added in Fast Track procedure at a later time

24-Nov-2016 (2016-109) except for mandatory electives 03-98-FBM-172, 08-MBC-EMV-172 added in Fast Track procedure at a later time

06-Dec-2017 (2017-71)

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 Courses

(40 ECTS credits)

Lab Course Model Organisms

(20 ECTS credits)

Module title		Abbreviation
Model Organisms		03-98-MMOD-152-mo1
Module coordinator		Module offered by
Dean of Studies Biomedizin (Biomedicine)		Faculty of Medicine
ECTS	Method of grading	Only after succ. compl. of module(s)
20	numerical grade	--
Duration	Module level	Other prerequisites
1 semester	graduate	--
Contents		
<p>With the help of selected eukaryotic model organisms (mouse, fish, Drosophila, nematodes and flatworms, yeast) and complex tissue models, students will become familiar with methods and questions of experimental biomedicine and will apply these. Building on the students' knowledge of anatomy, cell biology and developmental biology, the module will illustrate the relevance and usage of individual models for understanding physiological processes and pathophysiological changes and will experimentally analyse these with molecular, cell biological, histological and imaging techniques. The module will acquaint students with cell-based strategies for regenerative therapies and biodiagnostics as well as an alternative to animal experiments. Over the course of one week each, students will examine model organisms in detail, also taking into account current research.</p>		
Intended learning outcomes		
<p>Students are able to define key terms for each model organism and use them in the right context. They are able to correctly assess the importance of model organisms and 3D tissue culture systems for current biomedical issues and questions. They are able to discuss the relevant scientific advantages and disadvantages in a deliberative manner, also taking into account ethical issues. Under supervision, they are able to independently perform sophisticated genetic, cell biological and histological experiments and document the results. In particular they are able to present the results in a written report in accordance with scientific standards, to critically evaluate and interpret the data and put it in the context of current literature. Working in small groups as well as preparing and delivering group presentations, they demonstrate their knowledge of the contents covered as well as their team working skills.</p>		
Courses (type, number of weekly contact hours, language – if other than German)		
S (3) + P (15) Module taught in: German/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)		
Log (30 to 60 pages) Language of assessment: German or English Assessment offered: Once a year, winter semester		
Allocation of places		
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Additional information		
Additional information on module duration module block taught: 5 to 7 block sessions (1 week each).		
Workload		
600 h		
Teaching cycle		
--		
Referred to in LPO I (examination regulations for teaching-degree programmes)		
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Module appears in		
Master's degree (1 major) Biomedicine (2015)		
Master's with 1 major Biomedicine (2015)	JMU Würzburg • generated 18-Apr-2025 • exam. reg. data record Master (120 ECTS) Biomedizin - 2015	page 8 / 59



Master's degree (1 major) Biomedicine (2018)

Advanced Lab Courses

(20 ECTS credits)

Module title		Abbreviation
Advanced Laboratory Course in Biology		03-98-MFPB-152-m01
Module coordinator		Module offered by
Dean of Studies Biomedizin (Biomedicine)		Faculty of Medicine
ECTS	Method of grading	Only after succ. compl. of module(s)
10	(not) successfully completed	03-98-MMOD
Duration	Module level	Other prerequisites
1 semester	graduate	Prior approval from Dean of Studies required.
Contents		
Participation in a research project in the life sciences. Students will become familiar with new methods and approaches. Contents and methods will vary according to the research laboratory chosen.		
Intended learning outcomes		
The students learn current methods and their application to diverse and complex scientific questions. They are able to independently collect data, critically analyze and interpret it according to subject-specific criteria and place the results in the context of the relevant literature. They will gain an understanding for solution strategies. The students present their data via protocol and oral presentation.		
Courses (type, number of weekly contact hours, language – if other than German)		
P (10) Module taught in: German/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)		
practical assignment with examination talk (approx. 20 to 30 minutes) and log (approx. 15 to 20 pages) Language of assessment: German or English		
Allocation of places		
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Additional information		
Additional information on module duration: no less than 8 weeks, full time.		
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 appears in		
Master's degree (1 major) Biomedicine (2015) Master's degree (1 major) Biomedicine (2018)		

Module title		Abbreviation
Advanced Laboratory Course in Medicine		03-98-MFPM-152-m01
Module coordinator		Module offered by
Dean of Studies Biomedizin (Biomedicine)		Faculty of Medicine
ECTS	Method of grading	Only after succ. compl. of module(s)
10	(not) successfully completed	03-98-MMOD
Duration	Module level	Other prerequisites
1 semester	graduate	Prior approval from Dean of Studies required.
Contents		
Participation in a research project in the life sciences. Students will become familiar with new methods and approaches. Contents and methods will vary according to the research laboratory chosen.		
Intended learning outcomes		
The students learn current methods and their application to diverse and complex scientific questions. They are able to independently collect data, critically analyze and interpret it according to subject-specific criteria and place the results in the context of the relevant literature. They will gain an understanding for solution strategies. The students present their data via protocol and oral presentation.		
Courses (type, number of weekly contact hours, language – if other than German)		
P (10) Module taught in: German/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)		
practical assignment with examination talk (approx. 20 to 30 minutes) and log (approx. 15 to 20 pages) Language of assessment: German or English		
Allocation of places		
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Additional information		
Additional information on module duration: no less than 8 weeks, full time.		
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 appears in		
Master's degree (1 major) Biomedicine (2015) Master's degree (1 major) Biomedicine (2018)		

Compulsory Electives

(35 ECTS credits)

Compulsory Electives I

(15 ECTS credits)

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		
<p>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.</p>		
Intended learning outcomes		
<p>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.</p>		
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)		
<p>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</p>		
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 appears in

Master's degree (1 major) Biochemistry (2015)
 Master's degree (1 major) Biomedicine (2015)
 Master's degree (1 major) Experimental medicine (2015)
 Master's degree (1 major) Biochemistry (2017)
 Master's degree (1 major) Biomedicine (2018)
 Master's degree (1 major) Biochemistry (2019)

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		
<p>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.</p>		
Intended learning outcomes		
<p>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.</p>		
Courses (type, number of weekly contact hours, language — if other than German)		
V (2) Module taught in: German/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)		
<p>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)</p> <p>Students will be informed about the method, length and scope of the assessment prior to the course. Language of assessment: German or English Assessment offered: Once a year, winter semester</p>		
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 appears in		
<p>Master's degree (1 major) Biochemistry (2015) Master's degree (1 major) Biomedicine (2015) Master's degree (1 major) Experimental medicine (2015) Master's degree (1 major) Biochemistry (2017)</p>		
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Supplementary course Translational Medicine (2018)
Master's degree (1 major) Biomedicine (2018)
Master's degree (1 major) Translational Medicine (2018)
Master's degree (1 major) Biochemistry (2019)

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 tumorigenesis; 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/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 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 appears in		
Master's degree (1 major) Biochemistry (2015) Master's degree (1 major) Biomedicine (2015) Master's degree (1 major) Experimental medicine (2015) Master's degree (1 major) Biochemistry (2017) Supplementary course Translational Medicine (2018) Master's degree (1 major) Biomedicine (2018)		
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Master's degree (1 major) Translational Medicine (2018)
Master's degree (1 major) Biochemistry (2019)

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		
<p>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.</p>		
Intended learning outcomes		
<p>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.</p>		
Courses (type, number of weekly contact hours, language – if other than German)		
V (2) Module taught in: German/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)		
<p>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 or English Assessment offered: Once a year, summer semester</p>		
Allocation of places		
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Additional information		
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Workload		
150 h		
Teaching cycle		
--		
Referred to in LPO I (examination regulations for teaching-degree programmes)		
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Module appears in		
<p>Master's degree (1 major) Biochemistry (2015) Master's degree (1 major) Biomedicine (2015) Master's degree (1 major) Experimental medicine (2015) Master's degree (1 major) Biochemistry (2017)</p>		
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Supplementary course Translational Medicine (2018)
Master's degree (1 major) Biomedicine (2018)
Master's degree (1 major) Translational Medicine (2018)
Master's degree (1 major) Biochemistry (2019)

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		
<p>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).</p>		
Intended learning outcomes		
<p>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.</p>		
Courses (type, number of weekly contact hours, language – if other than German)		
V (2) Module taught in: German/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)		
<p>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)</p> <p>Students will be informed about the method, length and scope of the assessment prior to the course. Language of assessment: German or English Assessment offered: Once a year, winter semester</p>		
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 appears in

Master's degree (1 major) Biochemistry (2015)
 Master's degree (1 major) Biomedicine (2015)
 Master's degree (1 major) Experimental medicine (2015)
 Master's degree (1 major) Biochemistry (2017)
 Supplementary course Translational Medicine (2018)
 Master's degree (1 major) Biomedicine (2018)
 Master's degree (1 major) Translational Medicine (2018)
 Master's degree (1 major) Biochemistry (2019)

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		
--		
Additional information		
--		
Workload		
150 h		
Teaching cycle		
--		
Referred to in LPO I (examination regulations for teaching-degree programmes)		
--		
Module appears in		
Master's degree (1 major) Biochemistry (2015) Master's degree (1 major) Biomedicine (2015) Master's degree (1 major) Biochemistry (2017) Master's degree (1 major) Biomedicine (2018) Master's degree (1 major) Biochemistry (2019)		

Compulsory Electives II

(15 ECTS credits)

At least one module must be graded.

Module title		Abbreviation
RNA worlds		o8-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 appears in		
Master's degree (1 major) Biochemistry (2015) Master's degree (1 major) Biomedicine (2015) Master's degree (1 major) Biochemistry (2017) Master's degree (1 major) Biomedicine (2018) Master's degree (1 major) Biochemistry (2019)		

Module title		Abbreviation
Life cycle of proteins		o8-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 appears in		
Master's degree (1 major) Biochemistry (2015) Master's degree (1 major) Biomedicine (2015) Master's degree (1 major) Biochemistry (2017) Master's degree (1 major) Biomedicine (2018) Master's degree (1 major) Biochemistry (2019)		

Module title		Abbreviation
Genome stability		o8-MBC-GST-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 stability of genomes in dependence of certain structural and epigenetic factors.		
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 appears in		
Master's degree (1 major) Biochemistry (2015) Master's degree (1 major) Biomedicine (2015)		

Module title		Abbreviation
Immunology 1 BM		03-98-ImmM1-152-m01
Module coordinator		Module offered by
Institute of Virology and Immunobiology		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		
<p>Deeper insights into fundamental principles of immunology (General properties of the immune system, molecular and cellular basis of the immune response, development of the immune system, tolerance) with the help of a textbook (e.g. Abbas Cellular and Molecular Immunology) and accompanying review articles. Preparation of answers to test questions at home, presentation of articles and discussion of presentation of and answers to the test questions in the group. Seminar is given in English.</p>		
Intended learning outcomes		
<p>Students are able to understand current problems in immunology and to discuss these in detail. They learn to receive basic literature and to present it in a concise manner as talk (10-15 min, ppt) and as hand out. Active participation by providing feedback on the talks/presentation and receiving feedback given by participants and lecturer improves discussion skills (in English).</p>		
Courses (type, number of weekly contact hours, language – if other than German)		
S (2) Module taught in: German/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)		
<p>a) written examination (30 to 60 minutes) or c) oral examination of one candidate each (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 or English Assessment offered: Winter semester only</p>		
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 appears in		
<p>Master's degree (1 major) Biomedicine (2015) Master's degree (1 major) Experimental medicine (2015) Master's degree (1 major) Biomedicine (2018)</p>		

Module title		Abbreviation
Immunology 2 BM		03-98-ImmM2-152-m01
Module coordinator		Module offered by
Institute of Virology and Immunobiology		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		
<p>Deeper insights into current principles of molecular immunology with a focus on clinical aspects e.g. autoimmunity, immunotherapy, hypersensitivity and allergy, Tumor and transplantation immunology and immunodeficiency. To this end participants will read present and answer to questions on textbook chapters and current original literature, preset articles and discuss answers to test questions and the presentations in the group. Seminar will be hold in English.</p>		
Intended learning outcomes		
<p>Students are able to understand current problems in immunology and to discuss these in detail. They learn to receive basic literature and present it in a concise manner as talk (10-15 min, ppt) and as hand out. Active participation by providing feedback on the talks/presentation and receiving feedback given by participants and lecturer improves discussion skills (in English).</p>		
Courses (type, number of weekly contact hours, language – if other than German)		
S (2) Module taught in: German/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)		
<p>a) written examination (30 to 60 minutes) or b) oral examination of one candidate each (30 to 60 minutes) or c) 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: Summer semester only</p>		
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 appears in		
<p>Master's degree (1 major) Biomedicine (2015) Master's degree (1 major) Biomedicine (2018)</p>		

Module title		Abbreviation
Virology 1 BM		03-98-VirM1-152-m01
Module coordinator		Module offered by
Institute of Virology and Immunobiology		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		
<p>Learning of basic principles and deeper insights into the molecular processes of viral replication cycles. The main focus is on the structure of different virus types, different strategies of virus entry into target cells, and the molecular mechanisms of replication of viral RNA genomes, DNA genomes and retroviral genomes using selected example viruses. The overall topic is the regulation of replication, transcription and translation of viral genes. Introduction to immunological defense mechanisms against viral infections, including intrinsic, natural and adaptive immune responses and antiviral vaccines.</p>		
Intended learning outcomes		
<p>Expert knowledge of viral replication and regulation strategies at the molecular level. Independently develop and present research findings based on primary scientific literature. Acquire the ability to review and evaluate scientific results and generate scientific hypotheses from them.</p>		
Courses (type, number of weekly contact hours, language – if other than German)		
V (1) + S (2) Module taught in: German/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)		
<p>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) 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: Winter semester only</p>		
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 appears in		
<p>Master's degree (1 major) Biomedicine (2015) Master's degree (1 major) Experimental medicine (2015) Master's degree (1 major) Biomedicine (2018)</p>		

Module title		Abbreviation
Virology 2 BM		03-98-VirM2-152-m01
Module coordinator		Module offered by
Institute of Virology and Immunobiology		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		
<p>Learning of basic principles and deeper insights into the molecular processes of viral replication cycles. The main focus is on the structure of different virus types, different strategies of virus entry into target cells, and the molecular mechanisms of replication of viral RNA genomes, DNA genomes and retroviral genomes using selected example viruses. The overall topic is the regulation of replication, transcription and translation of viral genes. Introduction to immunological defense mechanisms against viral infections, including intrinsic, natural and adaptive immune responses and antiviral vaccines.</p>		
Intended learning outcomes		
<p>Expert knowledge of viral replication and regulation strategies at the molecular level. Independently develop and present research findings based on primary scientific literature. Acquire the ability to review and evaluate scientific results and generate scientific hypotheses from them.</p>		
Courses (type, number of weekly contact hours, language – if other than German)		
V (1) + S (2) Module taught in: German/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)		
<p>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) 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: Summer semester only</p>		
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 appears in		
<p>Master's degree (1 major) Biomedicine (2015) Master's degree (1 major) Biomedicine (2018)</p>		

Module title		Abbreviation
Advances in Immunology		03-98-ImmFor-152-m01
Module coordinator		Module offered by
Institute of Virology and Immunobiology		Faculty of Medicine
ECTS	Method of grading	Only after succ. compl. of module(s)
5	(not) successfully completed	--
Duration	Module level	Other prerequisites
1 semester	graduate	--
Contents		
Presentation of current research topics with ensuing discussion. Presentation of recent literature and/or own experiments in front of an expert audience. Formulation and reception of critical questions on design and interpretation of experiments and development of research questions. Seminar in English.		
Intended learning outcomes		
Presentation of current literature/and or own experiments to a scientific audience (in English). Learn to receive and formulate critical questions on design and interpretation of experiments and the development of research questions.		
Courses (type, number of weekly contact hours, language – if other than German)		
S (3) Module taught in: German/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)		
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 appears in		
Master's degree (1 major) Biomedicine (2015) Master's degree (1 major) Biomedicine (2018)		

Module title		Abbreviation
Bioinformatics B		07-MBI-B-152-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)
5	(not) successfully completed	--
Duration	Module level	Other prerequisites
1 semester	graduate	--
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) 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		
150 h		
Teaching cycle		
--		
Referred to in LPO I (examination regulations for teaching-degree programmes)		
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Module appears in		
Master's degree (1 major) Biology (2015) Master's degree (1 major) Biomedicine (2015) Master's degree (1 major) Mathematics (2016) Master's degree (1 major) Computational Mathematics (2016) Master's degree (1 major) Biosciences (2016) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016) Master's degree (1 major) Biosciences (2017) Master's degree (1 major) Biomedicine (2018) Master's degree (1 major) Biosciences (2018) Master's degree (1 major) Computational Mathematics (2019)		
Master's with 1 major Biomedicine (2015)	JMU Würzburg • generated 18-Apr-2025 • exam. reg. data record Master (120 ECTS) Biomedizin - 2015	page 35 / 59

Master's degree (1 major) Mathematics (2019)
 Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)
 Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)
 Master's degree (1 major) Biosciences (2021)
 Master's degree (1 major) Computational Mathematics (2022)
 Master's degree (1 major) Mathematics (2022)
 exchange program Biosciences (2022)
 Master's degree (1 major) Biosciences (2023)
 Master's degree (1 major) Biosciences (2024)
 Master's degree (1 major) Computational Mathematics (2024)
 Master's degree (1 major) Mathematics (2024)
 Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)
 Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Module title		Abbreviation
Systems Biology B		07-MS-B-152-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)
5	(not) successfully completed	--
Duration	Module level	Other prerequisites
1 semester	graduate	--
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) 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		
--		
Additional information		
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Workload		
150 h		
Teaching cycle		
--		
Referred to in LPO I (examination regulations for teaching-degree programmes)		
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Module appears in		
Master's degree (1 major) Biology (2015) Master's degree (1 major) Biomedicine (2015) Master's degree (1 major) Mathematics (2016) Master's degree (1 major) Computational Mathematics (2016) Master's degree (1 major) Biosciences (2016) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016) Master's degree (1 major) Biosciences (2017) Master's degree (1 major) Biomedicine (2018) Master's degree (1 major) Biosciences (2018) Master's degree (1 major) Computational Mathematics (2019)		
Master's with 1 major Biomedicine (2015)	JMU Würzburg • generated 18-Apr-2025 • exam. reg. data record Master (120 ECTS) Biomedizin - 2015	page 37 / 59

Master's degree (1 major) Mathematics (2019)
 Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)
 Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)
 Master's degree (1 major) Biosciences (2021)
 Master's degree (1 major) Computational Mathematics (2022)
 Master's degree (1 major) Mathematics (2022)
 Master's degree (1 major) Biosciences (2023)
 Master's degree (1 major) Biosciences (2024)
 Master's degree (1 major) Computational Mathematics (2024)
 Master's degree (1 major) Mathematics (2024)
 Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)
 Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Module title		Abbreviation
Infection Biology BM		07-MM1-B-152-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	(not) successfully completed	--
Duration	Module level	Other prerequisites
1 semester	graduate	--
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) 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 appears in		
Master's degree (1 major) Biomedicine (2015)		

Module title		Abbreviation
Pathogenicity of Microorganisms BM		07-MM2-B-152-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	(not) successfully completed	--
Duration	Module level	Other prerequisites
1 semester	graduate	--
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) 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 appears in		
Master's degree (1 major) Biomedicine (2015)		

Module title		Abbreviation
Cell and Developmental Biology Master BM		07-MZE-BM-152-m01
Module coordinator		Module offered by
holder of the Chair of Cell Biology and Developmental Biology		Faculty of Biology
ECTS	Method of grading	Only after succ. compl. of module(s)
5	(not) successfully completed	--
Duration	Module level	Other prerequisites
1 semester	graduate	--
Contents		
<p>The module consists of the lecture <i>Zellpathologie (Cytopathology)</i> and the seminar <i>Zellbiologie-Meilensteine und Perspektiven (Milestones and Perspectives of Cell Biology)</i>. The lecture describes pathological states of the cell and unravels their biological causes and consequences, such as infection, apoptosis, senescence, metabolic disorders and cancer. In the seminar <i>Milestones and Perspectives of Cell Biology</i>, classic ground-breaking publications in the field of cell biology are discussed from an unusual point of view.</p>		
Intended learning outcomes		
Participants possess scientific background knowledge on cytopathology and are able to put this into the broader context of cell biology research.		
Courses (type, number of weekly contact hours, language – if other than German)		
V (1) + S (2) Module taught in: German/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)		
<p>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</p>		
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 appears in		
Master's degree (1 major) Biomedicine (2015)		

Module title		Abbreviation
Human Genetics Seminar		03-98-MHGS-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)
5	(not) successfully completed	--
Duration	Module level	Other prerequisites
1 semester	graduate	--
Contents		
Current topics and developments in human genetics.		
Intended learning outcomes		
Independent preparation and presentation of scientific articles. Acquire the ability to critically discuss latest developments and ethical aspects in human genetics.		
Courses (type, number of weekly contact hours, language — if other than German)		
S (2) Module taught in: German/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 appears in		
Master's degree (1 major) Biomedicine (2015) Master's degree (1 major) Biomedicine (2018)		

Module title		Abbreviation
Practical Course in Human Genetics		03-98-MHGP-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	(not) successfully completed	--
Duration	Module level	Other prerequisites
1 semester	graduate	--
Contents		
Becoming familiar with molecular genetic techniques via hands-on training. Analysis of genetic variants in monogenic disorders. Application of necessary techniques.		
Intended learning outcomes		
Ability to independently apply basic working techniques to analyze genetic variants. Documenting, checking, evaluating and error analysis of the results. Acquire the ability to delineate and critically discuss experimental results.		
Courses (type, number of weekly contact hours, language – if other than German)		
P (10) Module taught in: German/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		
Additional information on module duration: 4 weeks, full time.		
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 appears in		
Master's degree (1 major) Biomedicine (2015) Master's degree (1 major) Biomedicine (2018)		

Module title		Abbreviation
Biomedical courses from other programs		03-98-MVAND-152-m01
Module coordinator		Module offered by
Dean of Studies Biomedizin (Biomedicine)		Faculty of Medicine
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		
Students broaden their insights into related disciplines and thereby complement the teaching portfolio of the program.		
Intended learning outcomes		
Students understand the approaches of related disciplines and are able to apply corresponding concepts and methods to problems in translational medicine. They possess enhanced cooperation and communication skills across disciplinary boundaries.		
Courses (type, number of weekly contact hours, language – if other than German)		
V (3) Module taught in: German/English Course type: alternatively P or S		
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 appears in		
Master's degree (1 major) Biomedicine (2015) Master's degree (1 major) Biomedicine (2018)		

Module title		Abbreviation
Electron microscopy and image processing in structural biology		o8-MBC-EMV-172-mo1
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		
<p>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.</p>		
Intended learning outcomes		
<p>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.</p>		
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)		
<p>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</p>		
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 appears in

Master's degree (1 major) Biomedicine (2015)
 Master's degree (1 major) Biochemistry (2017)
 Master's degree (1 major) Biomedicine (2018)
 Master's degree (1 major) Biochemistry (2019)

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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Module appears in		
Master's degree (1 major) Biochemistry (2015) Master's degree (1 major) Biomedicine (2015) Master's degree (1 major) Biochemistry (2017) Master's degree (1 major) Biomedicine (2018) Master's degree (1 major) Biochemistry (2019)		

Module title		Abbreviation
Fluorescence methods in biomedicine		03-98-FBM-172-m01
Module coordinator		Module offered by
holder of the Professorship of Molecular Microscopy		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		
<p>Basics of molecular fluorescence and microscopy via lectures and accompanying seminars. The focus is in particular in the complementary range of fluorescence methods that cover the various biomedical scales and ii) the various fluorescence probes and their special properties. This includes, in particular, wide-field methods, confocal methods and spectroscopic methods with application examples, as well as fluorescence probes such as synthetic fluorophores, nano-particles, clonable tags and advanced labeling techniques e.g. via unnatural amino acids.</p>		
Intended learning outcomes		
<p>Understanding of the optical and photophysical basics of fluorescence imaging and spectroscopy. Professional evaluation with regard to a suitable fluorescence method in order to be able to answer a specific biomedical question. Evaluating and assessing possible challenges. Independent development and presentation of current literature in the accompanying seminar. Acquiring the ability to discuss scientific aspects of fluorescence imaging.</p>		
Courses (type, number of weekly contact hours, language — if other than German)		
V (2) + S (1) Module taught in: German/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)		
<p>a) oral examination of one candidate each (20 to 30 minutes) or d) oral examination in groups of up to 3 candidates (approx. 30 to 60 minutes) or e) presentation (20 to 30 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</p>		
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 appears in		
<p>Master's degree (1 major) Biomedicine (2015) Master's degree (1 major) Biomedicine (2018)</p>		

Compulsory Electives III

(5 ECTS credits)

Module title		Abbreviation
Knowledge Transfer / Tutoring		03-98-MTUT2-152-m01
Module coordinator		Module offered by
Dean of Studies Biomedizin (Biomedicine)		Faculty of Medicine
ECTS	Method of grading	Only after succ. compl. of module(s)
2	(not) successfully completed	--
Duration	Module level	Other prerequisites
1 semester	graduate	May only be taken as an alternative to MTUT3.
Contents		
Students work as tutors. They support other students, in particular in the context of courses and study planning, and they participate as assistants in the organisation and planning of tutorials and lab courses.		
Intended learning outcomes		
Tutors are able to communicate complex technical facts in a clear and structured way. They have gained experience in the supervision and motivation of groups, and they have practiced applying conflict resolution strategies.		
Courses (type, number of weekly contact hours, language – if other than German)		
T (2) Module taught in: German/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) or f) preparing and supervising study groups/student lab courses (type and length/scope of assessment to be specified at the beginning of the course). 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		
60 h		
Teaching cycle		
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Referred to in LPO I (examination regulations for teaching-degree programmes)		
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Module appears in		
Master's degree (1 major) Biomedicine (2015) Master's degree (1 major) Biomedicine (2018)		

Module title		Abbreviation
Knowledge Transfer / Tutoring		03-98-MTUT3-152-m01
Module coordinator		Module offered by
Dean of Studies Biomedizin (Biomedicine)		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	graduate	May only be taken as an alternative to MTUT2.
Contents		
Students work as tutors. They support other students, in particular in the context of courses and study planning, and they participate as assistants in the organization and implementation of tutorials and lab courses.		
Intended learning outcomes		
Tutors are able to communicate complex technical facts in a clear and structured way. They have gained experience in the supervision and motivation of groups, and they have practiced applying conflict resolution strategies.		
Courses (type, number of weekly contact hours, language – if other than German)		
T (3) Module taught in: German/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) or f) preparing and supervising study groups/student lab courses (type and length/scope of assessment to be specified at the beginning of the course). 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		
90 h		
Teaching cycle		
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Referred to in LPO I (examination regulations for teaching-degree programmes)		
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Module appears in		
Master's degree (1 major) Biomedicine (2015) Master's degree (1 major) Biomedicine (2018)		

Module title		Abbreviation
Clinical Medicine		03-98-MKM2-152-m01
Module coordinator		Module offered by
Dean of Studies Biomedizin (Biomedicine)		Faculty of Medicine
ECTS	Method of grading	Only after succ. compl. of module(s)
2	(not) successfully completed	--
Duration	Module level	Other prerequisites
1 semester	graduate	May only be taken as an alternative to MKM3.
Contents		
Participation in a basic clinical lecture for medical students to gain insight into clinical practice. The contents depend on the respective subject taken.		
Intended learning outcomes		
The students are able to evaluate clinical questions and procedures. They have the ability to interconnect basic experimental knowledge with corresponding clinical applications and they are able to initiate interprofessional collaboration.		
Courses (type, number of weekly contact hours, language – if other than German)		
V (2) Module taught in: German/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		
60 h		
Teaching cycle		
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Referred to in LPO I (examination regulations for teaching-degree programmes)		
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Module appears in		
Master's degree (1 major) Biomedicine (2015) Master's degree (1 major) Biomedicine (2018)		

Module title		Abbreviation
Clinical Medicine		03-98-MKM3-152-m01
Module coordinator		Module offered by
Dean of Studies Biomedizin (Biomedicine)		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	graduate	May only be taken as an alternative to MKM2.
Contents		
Participation in a basic clinical lecture for medical students to gain insight into clinical practice. The contents depend on the respective subject taken.		
Intended learning outcomes		
The students are able to evaluate clinical questions and procedures. They have the ability to interconnect basic experimental knowledge with corresponding clinical applications and they are able to initiate interprofessional collaboration.		
Courses (type, number of weekly contact hours, language – if other than German)		
V (3) Module taught in: German/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		
90 h		
Teaching cycle		
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Referred to in LPO I (examination regulations for teaching-degree programmes)		
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Module appears in		
Master's degree (1 major) Biomedicine (2015) Master's degree (1 major) Biomedicine (2018)		



Thesis

(45 ECTS credits)

Research Practical Course

(15 ECTS credits)

Module title		Abbreviation
Internship in a Research Lab		03-98-MPPF-152-m01
Module coordinator		Module offered by
Dean of Studies Biomedizin (Biomedicine)		Faculty of Medicine
ECTS	Method of grading	Only after succ. compl. of module(s)
15	(not) successfully completed	--
Duration	Module level	Other prerequisites
1 semester	graduate	Prior approval from Dean of Studies required.
Contents		
Project work in a research laboratory, focusing on training in new methods and the in-depth analysis of a complex scientific problem. This project may lay the foundation for a subsequent Master's thesis.		
Intended learning outcomes		
Execution of complex sequential experimental methods. Students gain an in-sight into new areas of research on the basis of current literature and knowledge transfer. Analysis and documentation of the results.		
Courses (type, number of weekly contact hours, language – if other than German)		
P (15) Module taught in: German/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)		
Log (approx. 20 to 30 pages) or research proposal for thesis based on project (approx. 10 to 20 pages) Language of assessment: English		
Allocation of places		
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Additional information		
Additional information on module duration: no less than 10 weeks, full time.		
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 appears in		
Master's degree (1 major) Biomedicine (2015) Master's degree (1 major) Biomedicine (2018)		

Thesis and Colloquium

(30 ECTS credits)

Module title		Abbreviation
Master Thesis Biomedicine		03-98-MTH-152-m01
Module coordinator		Module offered by
Dean of Studies Biomedizin (Biomedicine)		Faculty of Medicine
ECTS	Method of grading	Only after succ. compl. of module(s)
25	numerical grade	--
Duration	Module level	Other prerequisites
1 semester	graduate	--
Contents		
Students conduct a scientific research project using appropriate methods and adhering to the principles of good scientific practice within six months. They document and discuss their work in a thesis.		
Intended learning outcomes		
The students are qualified to apply acquired experimental and scientific competences to a concrete, current scientific problem and to carry out experiments according to the rules of good scientific practice. They are able to independently acquire the current state of science on a specific issue in order to derive ideas for a project to be worked on. They have the ability to formulate goals of a biomedical project and to develop solution strategies in a team. They are competent to document their work, to present it in a written thesis according to a scientific publication style and to interpret it in a larger context.		
Courses (type, number of weekly contact hours, language — if other than German)		
No courses assigned to module Module taught in: German/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)		
Master's thesis (approx. 30 to 60 pages) Language of assessment: 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 appears in		
Master's degree (1 major) Biomedicine (2015) Master's degree (1 major) Biomedicine (2018)		

Module title		Abbreviation
Colloquium		03-98-MKO-152-m01
Module coordinator		Module offered by
Dean of Studies Biomedizin (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		
Students present and defend the results of their thesis projects in a scientific colloquium.		
Intended learning outcomes		
Students are able to present and defend the data from their thesis project in front of a professional audience. Knowledge of subject-related topics and transfer performance is demonstrated in the discussion.		
Courses (type, number of weekly contact hours, language — if other than German)		
K (o) Module taught in: German/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)		
final colloquium (approx. 30 to 45 minutes) 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 appears in		
Master's degree (1 major) Biomedicine (2015) Master's degree (1 major) Biomedicine (2018)		