

Background Modules

bio605 - Molecular Genetics and Cell Biology

Module label	Molecular Genetics and Cell Biology	
Module code	bio605	
Credit points	12.0 KP	
Workload	360 h	
Applicability of the module	<ul style="list-style-type: none"> • Master's Programme Biology (Master) > Background Modules • Master's Programme Biology (Master) > Background Modules • Master's Programme Molecular Biomedicine (Master) > Background Modules • Master's Programme Neuroscience (Master) > Background Modules 	
Responsible persons	<ul style="list-style-type: none"> • Neidhardt, John (module responsibility) • Neidhardt, John (authorised to take exams) • Koch, Karl-Wilhelm (authorised to take exams) • Jüscke, Christoph (authorised to take exams) 	
Prerequisites	BSc (Biology, Biochemistry)	
Skills to be acquired in this module	<p>++ deepened biological expertise ++ deepened knowledge of biological working methods + data analysis skills ++ interdisciplinary thinking + critical and analytical thinking + independent searching and knowledge of scientific literature + data presentation and discussion (E) (written and spoken) + teamwork + ethics and professional behaviour + project and time management</p> <p>Addressing students with an emphasis on molecular biology, molecular genetics, cell biology, and neurobiology</p>	
Module contents	<p>Lecture: To improve knowledge in molecular genetics, molecular biology and cell biology in correlation with human diseases. Exercise: Learn to transfer the theoretical knowledge to experiments. Gaining methodological knowledge in molecular genetics, cell biology and therapeutic approaches. Initial training on how to perform research projects. Subjects of the lecture and seminar: Molecular bases of neurodegenerative diseases, structure and function of DNA/RNA/proteins/membranes, cytoskeleton, cell cycle, programmed cell death, cells in the social structure. Exercises: Learning current methods of molecular biology and human genetics; high throughput technologies, introduction to cell cultivation techniques.</p>	
Recommended reading	Textbooks of Cell Biology	
Links	http://www.uni-oldenburg.de/humangenetik/	
Language of instruction	English	
Duration (semesters)	1 Semester	
Module frequency	winter term	
Module capacity	15	
Reference text	associated with bio900	
Type of module	Wahlpflicht / Elective	
Module level	MM (Mastermodul / Master module)	
Teaching/Learning method	Lecture, seminar, exercise	
Previous knowledge	Basic knowledge in cell biology, genetics, biochemistry	
Examination	Prüfungszeiten	Type of examination
Final exam of module	written examination (70 %), paper(s) presentation 30 %; not graded: signed lab protocols, regular active participation is required for the module to be passed.	

Type of course	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		2	WiSe	28
Seminar		1	WiSe	14
Exercises		5	WiSe	70
Total module attendance time				112 h

bio695 - Biochemical concepts in signal transduction

Module label	Biochemical concepts in signal transduction			
Module code	bio695			
Credit points	12.0 KP			
Workload	360 h			
Applicability of the module	<ul style="list-style-type: none"> • Master's Programme Biology (Master) > Background Modules • Master's Programme Biology (Master) > Background Modules • Master's Programme Molecular Biomedicine (Master) > Background Modules • Master's Programme Neuroscience (Master) > Background Modules 			
Responsible persons	<ul style="list-style-type: none"> • Koch, Karl-Wilhelm (module responsibility) • Koch, Karl-Wilhelm (authorised to take exams) • Scholten, Alexander (authorised to take exams) • Scholten, Alexander (Module counselling) 			
Prerequisites	none			
Skills to be acquired in this module	++ deepened knowledge of biological working methods ++ methods: protein expression and purification, functional assays, enzyme kinetics, spectroscopic techniques ++ data analysis skills + interdisciplinary thinking ++ critical and analytical thinking + independent searching and knowledge of scientific literature + ability to perform independent biological research ++ data presentation and discussion in German and English (written and spoken) ++ teamwork + project and time management			
Module contents	Lecture: Molecular fundamentals of cellular signal processes Seminar: Signal transduction Exercises: Experiments on cellular signal transduction and enzymology Mechanisms of biochemical signal transduction are imparted theoretically and experimentally			
Recommended reading	Textbooks of cell biology and biochemistry. Current literature on topics of signal transduction (as announced in the preparatory meeting).			
Links				
Language of instruction	English			
Duration (semesters)	1 Semester			
Module frequency	winter term			
Module capacity	20			
Type of module	Wahlpflicht / Elective			
Module level	MM (Mastermodul / Master module)			
Teaching/Learning method	Lecture, seminar, exercise			
Examination	Prüfungszeiten	Type of examination		
Final exam of module		written examination (90 minutes) (50%), protocols (50%) Prerequisite for passing the module is active participation: Presentation(s) in the seminar		
Type of course	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		1	WiSe	14
Seminar		1	WiSe	14
Exercises		6	WiSe	84
Total module attendance time				112 h

gsw010 - Molecular Physiology

Module label	Molecular Physiology
Module code	gsw010
Credit points	6.0 KP
Workload	180 h
Applicability of the module	<ul style="list-style-type: none"> • Master's Programme Molecular Biomedicine (Master) > Background Modules
Responsible persons	<ul style="list-style-type: none"> • Milenkovic, Ivan (module responsibility) • Milenkovic, Ivan (authorised to take exams) • Radulovic-Keine, Tamara (authorised to take exams) • Keine, Christian (authorised to take exams) • Radulovic-Keine, Tamara (Module counselling) • Milenkovic, Ivan (Module counselling)
Prerequisites	Enrolment in Master's programme Molecular Biomedicine; Knowledge of cell biology is beneficial for comprehension of lecture content
Skills to be acquired in this module	<p>Goals of the Module: Upon successful completion of this module, students</p> <ul style="list-style-type: none"> - know molecular mechanisms of cellular physiology - know physiology of the following human body organ systems: muscular system, nervous system, cardiovascular system, respiratory system, urinary system - understand pathophysiology of certain diseases - know basic principles of functional tests for certain organ systems. <p>Competencies: ++ deepened biological expertise ++ deepened clinical/pathological expertise ++ deepened knowledge of medical diagnostic methods + data analysis and clinical interpretation + interdisciplinary thinking</p>
Module contents	<p>The module focuses on physiology of the cell, physiology of human organ systems in health and disease, homeostatic regulation mechanisms</p> <p>Lecture topics:</p> <ol style="list-style-type: none"> 1. Cellular mechanisms of excitability 2. Synaptic transmission 3. Muscle contraction 4. Spinal cord reflexes 5. Motor skills 6. Basic principles of circulatory function 7. Pulmonary ventilation 8. Regulation of respiration 9. General sensory physiology 10. Physiology of special senses 11. Kidneys 12. Water homeostasis and osmoregulation <p>Exercise:</p> <ol style="list-style-type: none"> 1. Excitability of nerve cells and AP propagation 2. Reflexes 3. Electrocardiography 4. Pulmonary function tests and regulation of respiration 5. Functional tests for sensory systems 6. Water and osmolarity homeostasis
Recommended reading	Guyton and Hall - Textbook of medical physiology (covers most topics) Kandler, Schwarz, Jessell - Principles of neural science Gary G. Matthews – Cellular Physiology of Nerve and Muscle
Links	https://uol.de/physiologie
Language of instruction	English
Duration (semesters)	1 Semester
Module frequency	winter and summer semester
Module capacity	10 (participation at lectures is not restricted)
Reference text	The number of participants for the practical part of this module is limited to 10. Students which are enrolled in Master's programme Molecular Biomedicine will be preferred.
Type of module	Wahlpflicht / Elective

Module level	MM (Mastermodul / Master module)			
Previous knowledge	Basic knowledge in physiology and cell biology			
Examination	Prüfungszeiten	Type of examination		
Final exam of module	Oral examination (20 min.)			
Type of course	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		2	SuSe and WiSe	28
Practical training		2	SuSe and WiSe	28
Total module attendance time				56 h

gsw020 - Cellular and Subcellular Structures

Module label	Cellular and Subcellular Structures	
Module code	gsw020	
Credit points	6.0 KP	
Workload	180 h	
Applicability of the module	<ul style="list-style-type: none"> • Master's Programme Molecular Biomedicine (Master) > Background Modules 	
Responsible persons	<ul style="list-style-type: none"> • Bräuer, Anja (module responsibility) • Bräuer, Anja (authorised to take exams) • Maier, Esther Christine (authorised to take exams) • Maier, Esther Christine (Module counselling) 	
Prerequisites	Enrolment in Master's programme Molecular Biomedicine	
Skills to be acquired in this module	<p>Goals of the Module: Upon successful completion of this module, students know and understand cellular and subcellular structures and their function in the human body.</p> <p>Competencies: ++ deepened biological expertise ++ deepened clinical / pathological expertise, ++ deepened knowledge of biological working methods ++ deepened knowledge of clinical / pathological diagnostics, + interdisciplinary thinking, + critical and analytical thinking, + ability to perform independent biological research + ethics and professional behaviour</p>	
Module contents	<p>The module aims to give students an insight into microscopic functional anatomy. In this module, we will cover aspects of cell compartmentalisation and tissue organisation as the basis for normal function and homeostasis. In addition, we will cover examples of organ organisation and organ function. To introduce students to clinical concepts, and to deepen their understanding of the functional roles of cells and tissues, we will also cover aspects of the pathological basis of disease for selected organs and organelles.</p> <p>In the accompanying seminar, students will have the chance to work on light and electron microscopic pictures, to practice annotation and identification of cells and tissues. In addition, the students will read and present original literature. This will introduce select aspects of disease, but also introduce research methodology and scientific thinking.</p> <p>This course is not a full histology course, but it serves as an introduction to the topic, recapitulates aspects of cell biology and introduces a few select aspects of pathology. Thus, this module is aimed at students with little experience in cell biology.</p>	
Recommended reading	Molecular Biology of the Cell (Alberts et al., 6th ed.) Junqueira's Basic Histology: Text and Atlas (Mescher, 14th ed.) Robbins Basic Pathology (Kumar et al., 9th ed.)	
Links	https://uol.de/anatomie/forschung/	
Language of instruction	English	
Duration (semesters)	1 Semester	
Module frequency	summer semester	
Module capacity	25	
Reference text	For your notice: this course will NOT cover microscopic imaging techniques, if you are interested please see module gsw200_Microscopic Imaging in Biomedical Sciences.	
Type of module	Wahlpflicht / Elective	
Module level	MM (Mastermodul / Master module)	
Teaching/Learning method	Lecture and Seminar	
Previous knowledge	Basic knowledge in biology, chemistry, mathematics	
Examination	Prüfungszeiten	Type of examination
Final exam of module		written examination (45 min.)

Type of course	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		2	SuSe	28
Exercises		2	SuSe	28
Total module attendance time				56 h

gsw030 - Biophysical Chemistry

Module label	Biophysical Chemistry			
Module code	gsw030			
Credit points	6.0 KP			
Workload	180 h			
Applicability of the module	<ul style="list-style-type: none"> • Master's Programme Molecular Biomedicine (Master) > Background Modules 			
Responsible persons	<ul style="list-style-type: none"> • Winklhofer, Michael (authorised to take exams) • Winklhofer, Michael (module responsibility) 			
Prerequisites	Enrolment in Master's programme Molecular Biomedicine			
Skills to be acquired in this module	<p>Goals of the Module: Upon successful completion of this module, students understand physical principles underlying biochemistry and cell biology.</p> <p>Competencies: ++ deepened biological expertise + data analysis skills + usage of databases and computational tools + interdisciplinary thinking ++ critical and analytical thinking ++ data presentation and discussion</p>			
Module contents	<p>The module focuses on molecular biophysics, biophysical chemistry, biochemistry, cell biology.</p> <p>Dynamics of single molecules, molecular thermodynamics, statistical thermodynamics; diffusion; chemical equilibria involving macromolecules, signal amplification; spectroscopical techniques (molecular vibration and rotation spectroscopy, electronic absorption and fluorescence spectroscopy, FRET, NMR, Atomic force microscopy).</p>			
Recommended reading	<p>Principles of Biophysical Chemistry (van Holde et al., Pearson/Prentice Hall) Physical chemistry (Atkins, Wiley VCH) Biophysics - Searching for principles (Bialek, Princeton UP)</p>			
Links	https://uol.de/en/biology/groups-our-research/sensory-biology-of-animals			
Language of instruction	English			
Duration (semesters)	1 Semester			
Module frequency	summer semester			
Module capacity	20			
Type of module	Wahlpflicht / Elective			
Module level	MM (Mastermodul / Master module)			
Teaching/Learning method	Lecture and Seminar			
Previous knowledge	basic knowledge in biochemistry and physics			
Examination	Prüfungszeiten		Type of examination	
Final exam of module	short tests in seminar (75%) + presentation (25%)			
Type of course	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		2	SuSe	28
Seminar		2	SuSe	28
Total module attendance time				56 h

neu141 - Visual Neuroscience - Physiology and Anatomy

Module label	Visual Neuroscience - Physiology and Anatomy
Module code	neu141
Credit points	12.0 KP
Workload	360 h (3 SWS Lecture (VO) Total workload 90 h: 30h contact / 60h background literature reading and preparation for sh 1 SWS Seminar (SE) Total workload 30h: 10h contact / 20h literature reading and preparation of result presentation 8 SWS Supervised exercise (UE) Total workload 240h: 200h contact / 40h results analysis, writing of short reports for portfolio)
Applicability of the module	<ul style="list-style-type: none">• Master's Programme Biology (Master) > Background Modules• Master's Programme Biology (Master) > Background Modules• Master's Programme Molecular Biomedicine (Master) > Background Modules• Master's Programme Neuroscience (Master) > Background Modules
Responsible persons	<ul style="list-style-type: none">• Greschner, Martin (module responsibility)• Greschner, Martin (authorised to take exams)• Ahlers, Malte (authorised to take exams)• Dedek, Karin (authorised to take exams)• Dömer, Patrick (authorised to take exams)
Prerequisites	Basic knowledge of neurobiology
Skills to be acquired in this module	[nop] ++ Neurosci. knowlg. ++ Expt. Methods + Independent research ++ Scient. Literature + Social skills + Maths/Stats/Progr. ++ Data present./disc. + Scientific English + Ethics [/nop] Upon successful completion of this course, students • have basic knowledge of electrophysiological techniques used in neuroscience research • have acquired first practical skills in some electrophysiological techniques • have acquired basic skills in data analysis • have knowledge on retinal physiology and anatomy of the visual system • have basic knowledge of brain structures and their function • have profound knowledge of the architecture and circuits of the vertebrate retina • have acquired basic skills in histological techniques (tissue fixation, embedding, sectioning, staining procedures, immunohistochemistry) • have acquired fundamental skills in microscopy (differential interference contrast microscopy, phase-contrast microscopy, confocal microscopy)
Module contents	The background module Neurophysiology consists of two weeks of theoretical introduction and two weeks of hands-on lab exercises in patch or extracellular recordings and two weeks of hands-on lab exercises in anatomy. The seminars cover the following topics: • Visual system • Introduction to electrophysiological methods • Introduction into methods used in neuroanatomy and neurochemistry • Introduction into microscopy and image analysis • Presentation and discussion of results relating to the literature
Recommended reading	Course scripts and mandatory scientific literature discussed in the seminar will be available in Stud.IP. Background and seminar literature will be available in Stud.IP.
Links	
Language of instruction	English
Duration (semesters)	1 Semester

Module frequency	annually, summer term, first half (full time)
Module capacity	18 - with Visual Neuroscience: Anatomy (

Shared course components with (cannot be credited twice): neu151 BM Visual Neuroscience: Anatomy

)

Examination	Prüfungszeiten	Type of examination
Final exam of module		PF

during the course (summer semester, first half) In addition, mandatory but ungraded: seminar presentation

Type of course	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		2	SuSe or WiSe	28
Seminar		2	SuSe or WiSe	28
Exercises		2	SuSe or WiSe	28
Total module attendance time				84 h

neu220 - Neurocognition and Psychopharmacology

Module label	Neurocognition and Psychopharmacology
Module code	neu220
Credit points	6.0 KP
Workload	180 h (3 SWS Lecture (VO) "Introd. to Cognitive Neuroscience" and "Psychopharmacol." Total workload 135h: 45h contact/ 45 background reading/ 45h exam preparation 1 SWS Supervised exercise (UE) Total workload 45h: 14h contact/ 31h paper reading)
Applicability of the module	<ul style="list-style-type: none"> • Master's Programme Biology (Master) > Background Modules • Master's Programme Biology (Master) > Background Modules • Master's Programme Molecular Biomedicine (Master) > Background Modules • Master's Programme Neuroscience (Master) > Background Modules
Responsible persons	<ul style="list-style-type: none"> • Thiel, Christiane Margarete (module responsibility) • Thiel, Christiane Margarete (Module counselling) • Thiel, Christiane Margarete (authorised to take exams) • Gießing, Carsten (authorised to take exams)
Prerequisites	
Skills to be acquired in this module	<p>++ Neurosci. knowlg. + Expt. methods Independent research + Scient. literature + Social skills ++ Interdiscipl. knowlg. Maths/Stats/Progr. + Data present./disc. + Scientific English Ethics</p> <p>Upon successful completion of this course, students know the fundamentals of neurotransmission know the basic neural mechanisms underlying attention, learning, emotion, language and executive functions understand the relationship between disturbances in neurotransmitter systems, cognitive functions and psychiatric disease know the principles of drug treatment for psychiatric disorders have in-depth knowledge in selected areas of these topics are able to understand, explain and critically assess neuroscientific approaches in animals and humans are able to understand and critically assess published work in the area of cognitive neuroscience</p>
Module contents	<p>The lecture "Introduction to Cognitive Neuroscience" gives a short introduction into neuroanatomy and cognitive neuroscience methods and then covers different cognitive functions. Lecture topics: History of cognitive neuroscience Methods of cognitive neuroscience Attention Learning Emotion Language Executive functions. The supervised exercise either deepens that knowledge by exercises or discussions of recent papers/ talks on the respective topic covered during that week. The lecture "Psychopharmacology" illustrates the connection between neurotransmitters and behaviour and its links to psychiatric disease. The lecture contains several interactive parts to consolidate and critically evaluate the acquired knowledge. Lecture topics: Introduction to Terms and Definitions in Drug Research Dopaminergic and Noradrenergic System Cholinergic and Serotonergic System GABAergic and Glutamatergic System Addiction Depression Schizophrenia Anxiety Alzheimer's Disease</p>
Recommended reading	Ward J (2010) The Student's Guide to Cognitive Neuroscience. Psychology

Press
Meyer JS and Quenzer LF (2012) Psychopharmacology. Sinauer

Links				
Language of instruction		English		
Duration (semesters)		1 Semester		
Module frequency		jährlich		
Module capacity		30 (Recommended in combination with neu210 "Neurosensory Science and Behaviour", neu300 "Functional MRI data analysis" Shared course components with (cannot be credited twice): bio610 and psy181 (5.02.614 "Introduction to Cognitive Neuroscience", 5.02.615 "Psychopharmacology"))		
Reference text		Course in the second half of the semester Regular active participation is required to pass the module.		
Examination	Prüfungszeiten	Type of examination		
Final exam of module	as agreed, usually in the break after the winter term	100% written exam (content of the lectures)		
Type of course	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		3	--	42
Exercises		1	--	14
Total module attendance time				56 h

gsw230 - Molecular Pharmacology

Module label	Molecular Pharmacology			
Module code	gsw230			
Credit points	6.0 KP			
Workload	180 h			
Applicability of the module	<ul style="list-style-type: none"> • Master's Programme Molecular Biomedicine (Master) > Background Modules 			
Responsible persons	<ul style="list-style-type: none"> • Rauch, Bernhard (module responsibility) • Rauch, Bernhard (authorised to take exams) • Meyer, Ulrike (Module counselling) 			
Prerequisites	Enrolment in Master's programme Molecular Biomedicine			
Skills to be acquired in this module	<p>Goals of the module: upon completion of this module, students</p> <ul style="list-style-type: none"> - know about the subject of pharmacology in general, its areas of expertise such as pharmacokinetics and pharmacodynamics and their functions. - understand on which pathophysiological mechanisms diseases are based and on which molecular targets pharmaceuticals act in order to alleviate diseases. - know the basic actions and side effects of important drug groups. - understand basic parameters of clinical studies and the importance of clinical studies for therapeutic approaches. <p>Skills to be acquired/ competencies: ++ deepened biological expertise ++ deepened clinical expertise + deepened knowledge of biological working methods + deepened knowledge of clinical diagnostics + data analysis skills + interdisciplinary thinking + critical and analytical thinking + independent searching and knowledge of scientific literature + data presentation and discussion (written and spoken) + teamwork + ethics and professional behavior</p>			
Module contents	<ul style="list-style-type: none"> • Fundamentals of general pharmacology, its specialist areas such as pharmacokinetics and pharmacodynamics • Explanation of the pathophysiological mechanisms of diseases and the corresponding molecular drugs targets • Mechanisms of action and side effects of the major drug groups • Knowledge of basic parameters of clinical studies and understanding of the importance of clinical studies for therapeutic approaches 			
Recommended reading	Basic & Clinical Pharmacology (Basic and Clinical Pharmacology), McGraw-Hill Education (2020) For German speaking students: Kurzlehrbuch Pharmakologie und Toxikologie, Herdegen, Thieme (2019)			
Links				
Language of instruction	English			
Duration (semesters)	2 Semester			
Module frequency	winter term			
Module capacity	6 (Places are based on attended courses and given grades. Knowledge of physiology and biochemistry is required.)			
Examination	Prüfungszeiten	Type of examination		
Final exam of module	written or oral exam: at the end of winter semester, protocol: at the end of the practical course	written or oral examination (graded), protocol (ungraded)		
Type of course	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture and seminar		2	WiSe	28
Exercises		2	SuSe	28
Total module attendance time				56 h

gsw240 - Basic Immunology in Health and Disease

Module label	Basic Immunology in Health and Disease
Module code	gsw240
Credit points	6.0 KP
Workload	180 h
Applicability of the module	<ul style="list-style-type: none">• Master's Programme Molecular Biomedicine (Master) > Background Modules
Responsible persons	<ul style="list-style-type: none">• Loser, Karin (module responsibility)• Loser, Karin (authorised to take exams)• Mykicky, Nadine (authorised to take exams)
Prerequisites	Enrolment in Master's programme Molecular Biomedicine Basic knowledge in primary cell culture, quantitative real-time PCR, flow cytometry or histology would be highly desirable.
Skills to be acquired in this module	<p>Goals of this module: After completing this module, students are able to perform experimental approaches necessary to investigate selective immunological questions. These will comprise the normal function of the healthy immune system as well as processes leading to immune system dysregulation or immune system dysfunction in several systemic or organ specific diseases. Based on the basic knowledge of immunology acquired in the module students will be able to understand and analyze specific scientific problems, plan experimental approaches accordingly, and perform the experiments.</p> <p>Skills to be acquired/ competencies: ++ Deepened biological expertise ++ Deepened clinical expertise ++ Deepened knowledge of biological working methods + Deepened knowledge of clinical diagnostics ++ Data analysis skills + Interdisciplinary thinking ++ Critical and analytical thinking + Independent searching and knowledge of scientific literature + Ability to perform independent biological research ++ Data presentation and discussion (written and spoken) + Teamwork + Project and time management</p> <p>Methods: Key methods learned and implemented in this module include - Primary cell culture and cell separation - RNA extraction, reverse transcription and quantitative real-time PCR - Tissue sectioning, immunohistology and immunofluorescence staining including microscopy - Multicolor flow cytometry - Quantification of soluble factors and inflammatory mediators using multiplex-assay techniques</p>
Module contents	<p>Lecture: - Regulation of innate and adaptive immune responses in healthy individuals - Dysregulation of the immune system in inflammatory diseases, cancer or autoimmunity - Impact of the environment on immune regulation</p> <p>Seminar: - Presentation and discussion of laboratory methods used in the practical part</p> <p>Exercise: This module involves working on small research projects in groups of 2-3 students. The projects include basic immunology in humans and mice with the goal of better understanding the development of allergy, sterile inflammation or autoimmunity as well as immune regulation during cancer or infection. Using the knowledge of immune regulation gained in the lecture and seminar, students will analyze and evaluate specific scientific problems. Required methods of immunology, cell and molecular biology (e.g., flow cytometry, cell separation, isolation and culture of primary immune cells, gene expression studies, histology) are taught and used.</p>
Recommended reading	Text books of Immunology including Janeway's <i>Immunobiology</i> or Abbas et al. <i>Molecular and Cellular Immunology</i>
Links	
Language of instruction	English

Duration (semesters)	1 Semester	
Module frequency	winter term	
Module capacity	6 (Due to restrictions in space and limitations in equipment availability the number of participants for this module has to be limited. Students have to be enrolled in the Master's program Molecular Biomedicine.)	
Reference text	High priority is given to students of the Master's program Molecular Biomedicine. In exceptional cases, vacancies may be allocated to Biology students. However, allocation to students not enrolled in the Master's program Molecular Biomedicine can only be made by the lecturer(s) responsible for this module (personal application required).	
Examination	Prüfungszeiten	Type of examination
Final exam of module	After the end of the module.	50% presentation, 50% protocol
Type of course	Seminar and exercise	
SWS	4	
Frequency	WiSe	
Workload attendance time	56 h	

gsw250 - Molecular Microbiology

Module label	Molecular Microbiology		
Module code	gsw250		
Credit points	6.0 KP		
Workload	180 h		
Applicability of the module	<ul style="list-style-type: none"> • Master's Programme Molecular Biomedicine (Master) > Background Modules 		
Responsible persons	<ul style="list-style-type: none"> • van Eldijk, Timo Jakob Benjamin (module responsibility) • Muhsal, Linea Katharina (module responsibility) • van Eldijk, Timo Jakob Benjamin (authorised to take exams) • Muhsal, Linea Katharina (authorised to take exams) 		
Prerequisites	Enrolment in Master's programme Molecular Biomedicine		
Skills to be acquired in this module	<p>Goals of this module: Upon completion of this module the students will have a basic knowledge about bacteriology, antibiotic resistances and gene mutagenesis methods.</p> <p>Skills to be acquired/ competencies: ++ deepened biological expertise ++ deepened knowledge of biological working methods + deepened knowledge of clinical diagnostics + data analysis skills ++ interdisciplinary thinking ++ critical and analytical thinking ++ independent searching and knowledge of scientific literature ++ data presentation and discussion (written and spoken) + teamwork + ethics and professional behavior ++ project and time management</p>		
Module contents	<p>Lecture: In the first lectures, basic knowledge of general and specific bacteriology is taught. Subsequently, antibiotic resistance as well as resistance mechanisms are explained in more detail. Finally, the topic of horizontal gene transfer and mobile genetic elements will be discussed.</p> <p>Seminar: The seminar will address with the topic of antibiotic resistances. Students gain initial experience in formulating a scientific question and designing experiments to answer it. Different cloning strategies are discussed in detail.</p> <p>Practical course: The methods developed in the seminar will be put into practice. Antibiotic resistance plasmids will be modified using various techniques and the effects of these manipulations on bacterial physiology and resistance patterns will be investigated.</p>		
Recommended reading	Textbooks of microbiology. Current literature on antibiotic resistances and horizontal gene transfer will be announced in the lecture.		
Links			
Language of instruction	English		
Duration (semesters)	1 Semester		
Module frequency	winter term		
Module capacity	6 (participation at lectures is not restricted)		
Reference text	The lecture is held weekly during the semester (first half). Seminar and practical course form a joint block course.		
Examination	Prüfungszeiten	Type of examination	
Final exam of module	written examination: end of the module, presentation: during the seminar/practical course joint block, protocol: end of the practical course	graded: written examination, ungraded: presentation, protocols	
Type of course	Comment	SWS	Frequency
Lecture		1	WiSe
Seminar and exercise		3	WiSe
Total module attendance time			Workload of compulsory attendance
			56 h

gsw260 - Molecular Virology

Module label	Molecular Virology		
Module code	gsw260		
Credit points	6.0 KP		
Workload	180 h		
Applicability of the module	<ul style="list-style-type: none"> • Master's Programme Molecular Biomedicine (Master) > Background Modules 		
Responsible persons	<ul style="list-style-type: none"> • Kinast, Volker (module responsibility) • Kinast, Volker (authorised to take exams) 		
Prerequisites			
Skills to be acquired in this module	<p>Goals of this module: upon completion of this module, students</p> <ul style="list-style-type: none"> - know about general aspects of virology including the viral replication cycle, classification of viruses, virus-host-interactions, innate immune response and mechanisms of antiviral therapies - know safety aspects of working in a S2 laboratory and working with infectious agents - are able to understand, explain and evaluate fundamental concepts and research results in the field of virology <p>Skills to be acquired/ competencies: ++ comprehensive understanding of the fundamentals of virology ++ knowledge of virological working methods + data analysis skills ++ critical and analytical thinking + independent searching and knowledge of scientific literature ++ data presentation and discussion (written and spoken) + teamwork + ethics and professional behavior</p>		
Module contents	<p>Lecture: Fundamentals of virology</p> <p>Seminar: Discussion of selected aspects and methods of virology based on original/current literature</p> <p>Exercises: cell culture, viral replication assays, luminescence assays, microscopy, data analysis and interpretation</p>		
Recommended reading	Literature will be provided during the lecture/seminar		
Links			
Language of instruction	English		
Duration (semesters)	1 Semester		
Module frequency	summer term		
Module capacity	16		
Examination	Prüfungszeiten	Type of examination	
Final exam of module	at the end of the course	graded: written examination, ungraded: presentation (seminar), protocol (exercise)	
Type of course	Comment	SWS	Frequency
Lecture		1	SuSe
Seminar and exercise		3	SuSe
Total module attendance time			Workload of compulsory attendance
			56 h

bio845 - Introduction to Development and Evolution

Module label	Introduction to Development and Evolution
Module code	bio845
Credit points	6.0 KP
Workload	180 h
Applicability of the module	<ul style="list-style-type: none">• Master's Programme Biology (Master) > Background Modules• Master's Programme Biology (Master) > Background Modules• Master's Programme Molecular Biomedicine (Master) > Background Modules• Master's Programme Neuroscience (Master) > Background Modules
Responsible persons	<ul style="list-style-type: none">• Sienknecht, Ulrike (module responsibility)• Sienknecht, Ulrike (Module counselling)• Sienknecht, Ulrike (authorised to take exams)• Claußen, Maike (authorised to take exams)
Prerequisites	
Skills to be acquired in this module	

Upon successful completion of this course, students

- know the fundamental problems organisms share in development
- know the common basic steps of ontogenesis after comparing the life cycles of different species (both vertebrates and invertebrates)
- know the fundamentals of the genetic control of cell-fate specification, morphogenesis, and organogenesis
- know the principles of gene regulatory networks in development and are able to explain examples
- are able to explain and discuss mechanisms of development across taxonomic groups and questions about the evolution of developmental mechanisms
- have in-depth knowledge of the development of animal nervous systems, including cellular and net-work properties

skills:

- ++ deepened biological expertise
- + deepened knowledge of biological working methods
- ++ interdisciplinary thinking
- ++ critical and analytical thinking
- + independent searching and knowledge of scientific literature
- + ability to perform independent biological research
- + teamwork

Module contents

Lectures on the fundamentals and concepts of developmental biology, including evolutionary aspects. Parallel seminars matching the topics of the lectures and emphasizing discussion. Lecture topics:

- Introduction to Developmental Biology
- Cell-Cell Communication
- Differential Gene Expression (I and II)
- Early Development of Vertebrates, Gastrulation
- Neurulation
- Brain Development
- Axonal Growth, Target Selection, Synaptogenesis and Refinement
- Neural Crest
- Mesoderm Development
- Morphogenesis
- Developmental Mechanisms of Evolutionary Change
- Model Organisms in Developmental Biology
- Transgenic Mice
- Medical Implications of Developmental Biology

Recommended reading

textbook: Gilbert S.F.: Developmental Biology, Macmillan Publishers Ltd, 11th edition 2016 (current edition); and current literature on course topics

Links	
Language of instruction	English
Duration (semesters)	1 Semester
Module frequency	winter term
Module capacity	20 (
	selection criteria: sequence of registration
)

Reference text	associated with bio846 (neu120) (Lab Exercises in Development and Evolution)
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Type of module	Wahlpflicht / Elective
Module level	MM (Mastermodul / Master module)
Teaching/Learning method	Lecture, seminar
Previous knowledge	Fundamentals of organismic biology, developmental biology, evolutionary biology, neurobiology, genetics, molecular biology

Examination	Prüfungszeiten	Type of examination
Final exam of module	same winter term	oral exam of 30 minutes (or written exam)

Type of course	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		3	WiSe	45
Seminar		3	WiSe	45
Total module attendance time				90 h

gsw231 - Molecular Pharmacology and Toxicology

Module label	Molecular Pharmacology and Toxicology
Module code	gsw231
Credit points	6.0 KP
Workload	180 h
Applicability of the module	<ul style="list-style-type: none">• Master's Programme Molecular Biomedicine (Master) > Background Modules
Responsible persons	<ul style="list-style-type: none">• Rauch, Bernhard (module responsibility)• Rauch, Bernhard (authorised to take exams)• Meyer, Ulrike (Module counselling)
Prerequisites	Enrolment in the Master's programme „Molecular Biomedicine“ Enrolment in the Master's programme „Chemie“

Skills to be acquired in this module

Upon completion of this module, students

- know about the subject of pharmacology in general, its areas of expertise such as pharmacokinetics and pharmacodynamics and their functions.
- understand on which pathophysiological mechanisms diseases are based and on which molecular targets pharmaceuticals act in order to alleviate diseases.
- know the basic actions and side effects of important drug groups.
- understand basic parameters of clinical studies and the importance of clinical studies for therapeutic approaches.

Skills to be acquired/ competencies:

- ++ deepened biological expertise
- ++ deepened clinical expertise
- + interdisciplinary thinking
- + critical and analytical thinking
- + independent searching and knowledge of scientific literature
- + data presentation and discussion (written and spoken)
- + ethics and professional behavior
- + basic knowledge of physiology and biochemistry is required

Module contents

- Fundamentals of general pharmacology, its specialist areas such as pharmacokinetics and pharmacodynamics
- Explanation of the pathophysiological mechanisms of diseases and the corresponding molecular drug targets
- Mechanisms of action and side effects of the major drug groups Mechanisms of action and toxins
- Mechanisms of action of common toxins and antidotes
- Knowledge of basic parameters of clinical studies and understanding of the importance of clinical studies for therapeutic approaches

Recommended reading

Basic & Clinical Pharmacology (Basic and Clinical Pharmacology), McGraw-Hill Education (2020)
For German speaking students: Kurzlehrbuch Pharmakologie und Toxikologie, Herdegen, Thieme (2019)

Links		
Language of instruction	English	
Duration (semesters)	1 Semester	
Module frequency		
Module capacity	40	
Examination	Prüfungszeiten	Type of examination
Final exam of module		

Examination	Prüfungszeiten	Type of examination
		Klausur oder mündl. Prüfung
Type of course	Lecture	
SWS	4	
Frequency	SuSe or WiSe	
Workload attendance time	56 h 4 SWS	

gsw235 - Practical Molecular Pharmacology

Module label	Practical Molecular Pharmacology			
Module code	gsw235			
Credit points	6.0 KP			
Workload	180 h (5 SWS ca. 70 h (two weeks practical seminar/laboratory exercise))			
Applicability of the module	<ul style="list-style-type: none"> • Master's Programme Molecular Biomedicine (Master) > Background Modules 			
Responsible persons	<ul style="list-style-type: none"> • Rauch, Bernhard (module responsibility) • Rauch, Bernhard (authorised to take exams) • Meyer, Ulrike (Module counselling) 			
Prerequisites	<p>Enrolment in Master's programme admission requirement is attendance of the gsw230 module ("Lecture Molecular Pharmacology")</p> <p>Places are based on attended module "Lecture Molecular Pharmacology" and given grades. Knowledge of physiology and biochemistry is required.</p>			
Skills to be acquired in this module	<p>Upon completion of this module, students</p> <ul style="list-style-type: none"> - have fundamental knowledge of good laboratory practice. - have an in-depth understanding of different working methods in the laboratory. - understand basic parameters of studies and the importance for basic research and therapeutic approaches. <p>Skills to be acquired/ competencies:</p> <ul style="list-style-type: none"> ++ deepened biological expertise ++ deepened clinical expertise ++ deepened knowledge of biological working methods ++ data analysis skills ++ critical and analytical thinking + deepened knowledge of clinical diagnostics + interdisciplinary thinking + independent searching and knowledge of scientific literature + data presentation and discussion (written and spoken) + teamwork + ethics and professional behavior 			
Module contents	<ul style="list-style-type: none"> • Fundamentals of experimental pharmacology, common analytical laboratory techniques in this area • Explanation of the pathophysiological mechanisms of diseases and the corresponding molecular drugs targets • Specific knowledge on selected current research topic in the field of experimental pharmacology • Knowledge of basic parameters of clinical studies and understanding of the importance of clinical studies for therapeutic approaches 			
Recommended reading	<p>Basic & Clinical Pharmacology (Basic and Clinical Pharmacology), McGraw-Hill Education (2020)</p> <p>For German speaking students: Kurzlehrbuch Pharmakologie und Toxikologie, Herdegen, Thieme (2019)</p>			
Links				
Language of instruction	English			
Duration (semesters)	1 Semester			
Module frequency				
Module capacity	8			
Examination	Prüfungszeiten		Type of examination	
Final exam of module			Protokoll	
Type of course	Comment	SWS	Frequency	Workload of compulsory attendance
Seminar			SuSe or WiSe	0
Exercises		2	SuSe or WiSe	0
Total module attendance time				0 h

gsw270 - Introduction to Human Anatomy

Module label	Introduction to Human Anatomy			
Module code	gsw270			
Credit points	3.0 KP			
Workload	90 h (2 SWS)			
Applicability of the module	<ul style="list-style-type: none"> • Master's Programme Molecular Biomedicine (Master) > Background Modules 			
Responsible persons	<ul style="list-style-type: none"> • Maier, Esther Christine (module responsibility) • Maier, Esther Christine (authorised to take exams) 			
Prerequisites	Prerequisites: Enrolment in Master Molecular Biomedicine Previous knowledge: the modul is an introductory modul no specialist knowledge required			
Skills to be acquired in this module	Competencies Anatomical knowledge of body structure Functional anatomical knowledge of the body Understanding the anatomical basis for specific clinical symptoms Find and name anatomical structures during virtual dissections and annotations Group work			
Module contents	<p>Description</p> <p>+++ Anatomical knowledge ++ Social skills + Interdisciplinary knowledge + Data present./disc. ++ Scientific English ++ Ethics</p> <p>Students should be able to correctly identify the anatomical structures of the body and describe the major anatomical pathways connecting the different parts. They also should acquire an understanding of the functional anatomy. This knowledge is applied to analyse some specific examples of clinical symptoms, to deepen the students understanding of the functional relationships of the body parts. Lectures will be complete by virtual dissection excercises and anatomical seminars.</p>			
Recommended reading				
Links				
Language of instruction	English			
Duration (semesters)	1 Semester			
Module frequency				
Module capacity	24			
Examination	Prüfungszeiten	Type of examination		
Final exam of module	Portfolio oder mündl. Prüfung oder Präsentation		Oral exam or portfolio or presentation will be graded	
Type of course	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		1	SuSe or WiSe	0
Seminar		1	SuSe or WiSe	0
Total module attendance time				0 h

Clinical Modules

gsw060 - Epigenetics and Gene Regulation

Module label	Epigenetics and Gene Regulation
Module code	gsw060
Credit points	6.0 KP
Workload	180 h
Applicability of the module	<ul style="list-style-type: none"> • Master's Programme Molecular Biomedicine (Master) > Clinical Modules
Responsible persons	<ul style="list-style-type: none"> • Plösch, Torsten (module responsibility) • Heep, Axel (module responsibility) • Plösch, Torsten (authorised to take exams) • Heep, Axel (authorised to take exams) • Hinz, Cornelia (authorised to take exams)
Prerequisites	Enrolment in Master's programme Molecular Biomedicine
Skills to be acquired in this module	<p>Goals of the Module: Upon successful completion of this module, students</p> <ul style="list-style-type: none"> - know about epigenetic regulation of gene transcription - can determine different epigenetic features - have a basic understanding of the role of epigenetics in human disease <p>Competencies:</p> <ul style="list-style-type: none"> ++ deepened biological expertise + deepened clinical expertise ++ deepened knowledge of biological working methods + deepened knowledge of clinical diagnostics + data analysis skills + critical and analytical thinking + ability to perform independent biological research + data presentation and discussion (written and spoken) + teamwork
Module contents	<p>Lecture:</p> <ul style="list-style-type: none"> - introduction to epigenetics - regulation of gene expression - developmental epigenetics - cancer epigenetics - current methods - ethics <p>Seminar:</p> <ul style="list-style-type: none"> - presentation of important historical and current primary literature - presentation and discussion of lab methods used in the practical part <p>Exercise:</p> <ul style="list-style-type: none"> - Designing bisulfite PCR strategies for methylated DNA - analyses of datasets - DNA isolation from cells - <i>in vitro</i> methylation of DNA - methylation-specific restriction analysis (and PCR) - methylation-specific bisulfite PCR - histone characterization
Recommended reading	
Links	https://uol.de/en/paediatrics/perinatal-neurobiology
Language of instruction	English
Duration (semesters)	1 Semester
Module frequency	summer term
Module capacity	24
Reference text	The number of participants for this module is limited to 12. If there are more students registered than places available, lots will be drawn. Students which are enrolled in Master's programme Molecular Biomedicine will be preferred.
Type of module	Wahlpflicht / Elective
Module level	MM (Mastermodul / Master module)
Teaching/Learning method	Lecture, Seminar, Exercises
Previous knowledge	basic knowledge in cell and developmental biology, solid knowledge in

genetics

Examination	Prüfungszeiten	Type of examination
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Final exam of module

presentation 50%, protocol 50%

Type of course	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		1	SuSe	14
Seminar		1	SuSe	14
Exercises		2	SuSe	28
Total module attendance time				56 h

gsw070 - Gene-based Therapies in Human diseases

Module label	Gene-based Therapies in Human diseases			
Module code	gsw070			
Credit points	6.0 KP			
Workload	180 h			
Applicability of the module	<ul style="list-style-type: none"> • Master's Programme Molecular Biomedicine (Master) > Clinical Modules 			
Responsible persons	<ul style="list-style-type: none"> • Neidhardt, John (module responsibility) • Neidhardt, John (authorised to take exams) • Jüschke, Christoph (authorised to take exams) 			
Prerequisites	Enrolment in Master's programme Molecular Biomedicine			
Skills to be acquired in this module	<p>Competencies:</p> <ul style="list-style-type: none"> ++ deepened biological expertise ++ deepened clinical expertise ++ deepened knowledge of biological working methods <ul style="list-style-type: none"> + deepened knowledge of clinical diagnostics + data analysis skills + interdisciplinary thinking ++ critical and analytical thinking <ul style="list-style-type: none"> + independent searching and knowledge of scientific literature ++ ability to perform independent biological research <ul style="list-style-type: none"> + data presentation and discussion (written and spoken) + team work + project and time management <p>Addressing students with emphasis on translational/therapeutical interest in molecular biology, molecular genetics, cell biology and neurobiology.</p>			
Module contents	<p>The module focuses on translational research in human genetics, molecular biology, molecular genetics, translational medicine, cell- and neurobiology.</p> <p>Subjects of the lecture: Therapeutic strategies and research applications, molecular bases of neurodegenerative diseases, structure and function of DNA/RNA/proteins/membranes.</p> <p>Lecture: To improve knowledge in molecular genetics, molecular biology and cell biology in correlation with human diseases, gain knowledge in Antisense-Oligonucleotide-, U1- and CRISPR-based genetic therapies, viruses in gene therapy, cell sorting and diagnosis by FACS.</p> <p>Exercises: Learning current methods of therapy development; molecular biology and human genetics; high throughput technologies; introduction to cell cultivation techniques.</p> <p>Learn to transfer the theoretical knowledge to experiments. Gaining methodological knowledge in molecular genetics, cell biology and therapeutic approaches. Initial training on how to perform research projects.</p>			
Recommended reading	Molecular Biology of the Cell (Alberts et al., 6th edition)			
Links	https://uol.de/humangenetik/research-and-clinical-collaborations/			
Language of instruction	English			
Duration (semesters)	1 Semester			
Module frequency	summer semester			
Module capacity	10			
Type of module	Wahlpflicht / Elective			
Module level	MM (Mastermodul / Master module)			
Teaching/Learning method	Lecture and Exercise			
Previous knowledge	basic knowledge of cell biology, genetics			
Examination	Prüfungszeiten	Type of examination		
Final exam of module		written examination (90 min.) additionally ungraded: signed lab protocols and regular active participation is required for the module to be passed		
Type of course	Comment	SWS	Frequency	Workload of compulsory attendance

Type of course	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		1	SuSe	14
Exercises		3	SuSe	42
Total module attendance time				56 h

gsw080 - Genetic Diagnostics: from chromosomal aberrations to gene mutations

Module label	Genetic Diagnostics: from chromosomal aberrations to gene mutations
Module code	gsw080
Credit points	6.0 KP
Workload	180 h
Applicability of the module	<ul style="list-style-type: none">• Master's Programme Molecular Biomedicine (Master) > Clinical Modules
Responsible persons	<ul style="list-style-type: none">• Owczarek-Lipska, Marta (module responsibility)• Owczarek-Lipska, Marta (authorised to take exams)
Prerequisites	Enrolment in Master's programme Molecular Biomedicine
Skills to be acquired in this module	<p>Goals of the Module: to expand the knowledge about classical cytogenetics and molecular genetics as well as modern cyto- and molecular genetics technics applied in clinical diagnostics and research.</p> <p>Competencies: ++ deepened biological and clinical expertise (cytogenetics and molecular genetics) ++ deepened knowledge of biological working methods and clinical diagnostics (classical cyto- and molecular genetics laboratory methods) ++ data analysis skills + interdisciplinary thinking ++ critical and analytical thinking + independent searching and knowledge of scientific literature ++ ability to perform independent biological research + data presentation and discussion (written and spoken) + team work + project and time management</p>
Module contents	<p>The module focuses on genome- and gene mutations, cyto- and molecular genetics, human syndromes and diseases caused by different chromosomal aberrations.</p> <p>Lecture: essentials of classical cytogenetics and molecular genetics, classification of mutations, genetics syndromes/diseases, introduction to the genetic diagnostic laboratory techniques</p> <p>Exercises: chromosomal stainings, microscopy, karyotyping, identification of chromosomal aberrations, identification of gene mutations</p>
Recommended reading	Principles of Clinical Cytogenetics by Steven L. Gersen, Martha B. Keagle
Links	https://uol.de/genetik-gehirnfehlbildungen/forschungsschwerpunkte/
Language of instruction	English
Duration (semesters)	1 Semester
Module frequency	Second half of the winter semester
Module capacity	10
Reference text	

The number of participants for the practical part of this module is limited to 10. If there are more students registered than places available, max. 10 person, w/out any exepations. Students which are enrolled in Master's programme Molecular Biomedicine will be preferred.

Type of module	Wahlpflicht / Elective		
Module level	MM (Mastermodul / Master module)		
Teaching/Learning method	Lecture, Seminar and Exercise		
Previous knowledge	basic knowledge of genetics and cell biology		
Examination	Prüfungszeiten	Type of examination	
Final exam of module		written examination (90 min., 70%), presentation (30%) ungraded, but mandatory to take the exam	

Type of course	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		1	WiSe	14
Seminar		1	WiSe	14
Exercises		2	WiSe	28
Total module attendance time				56 h

gsw090 - Current Topics in Clinical Research

Module label	Current Topics in Clinical Research
Module code	gsw090
Credit points	6.0 KP
Workload	180 h
Applicability of the module	<ul style="list-style-type: none"> • Master's Programme Molecular Biomedicine (Master) > Clinical Modules
Responsible persons	<ul style="list-style-type: none"> • Dömer, Patrick (module responsibility) • Noster, Janina (authorised to take exams) • Dömer, Patrick (authorised to take exams) • Heep, Axel (authorised to take exams) • Plösch, Torsten (authorised to take exams) • Loser, Karin (authorised to take exams) • Hinz, Cornelia (authorised to take exams) • Dübbel, Lena (authorised to take exams) • Hamprecht, Axel (authorised to take exams) • Rauch, Bernhard (authorised to take exams) • Meyer, Helge (authorised to take exams) • Helgers, Simeon (authorised to take exams)
Prerequisites	Enrolment in Master's programme Molecular Biomedicine
Skills to be acquired in this module	<p>Goals of the Module: Upon successful completion of this module, students</p> <ul style="list-style-type: none"> - are familiar with the basic epigenetic mechanisms - know the principles of different sequencing techniques, both for genetic and epigenetic research - are familiar with the "first 1000 days of life concept" and how the early environment influences long term health - know how the human body is colonized - know about the basic mechanisms involved in CNV development during fetal and early postnatal life - know about the methods used to study molecular intercellular signaling - know about the non-invasive methods used to study functional brain development - know about the insults leading to cerebral ischemia - know about the mechanism of the neurovascular response - know about the cellular and electrophysiological effects of acute and chronic cerebral ischemia - know about the cell types, cellular interactions and molecular changes during peripheral nerve; degeneration and regeneration following nerve trauma - are able to explain some oncogenic mechanisms of viruses - can explain preeclampsia and its immunological regulation - are familiar with antibiotic classes, mode of actions of antibiotics, principles of antibiotic resistance, dissemination of current plasmids causing multi-resistance - know about differences between susceptibility, tolerance, resistance and persistence to antibiotics, the methods to determine minimal inhibitory concentrations, the causes of persistent infections, the characteristics of persister cells and mechanisms of persister cell formation, and current medical treatment strategies - are able to explain the concept of cancer immunosurveillance and immunoediting - can explain current strategies in immunotherapy of cancer including checkpoint inhibition, CAR T cell therapy and cancer vaccination - are able to explain the mechanisms underlying therapy resistance in malignant diseases, particularly cancers of the gastrointestinal tract and the hepatico-pancreatico-biliary system - can explain current strategies in cancer diagnostic, particularly liquid biopsy <p>Competencies: ++ deepened clinical expertise ++ deepened knowledge of biological working methods and clinical diagnostics ++ interdisciplinary thinking + data analysis skills ++ critical and analytical thinking + independent searching and knowledge of scientific literature + ethics and professional behavior</p>
Module contents	<p>The module focuses on molecular aspects as part of current clinical research in different fields.</p> <p>Lectures: (Part 1)</p>

- Genetic and epigenetic sequencing technology
- Epigenetic programming by early life events
- The human microbiome and colonization of the human body
- Molecular insights into functional brain development
- Basic mechanisms involved in CNS development during fetal and early postnatal life
- Introduction to methods used to study molecular signaling
- Introduction to non-invasive methods used to study functional brain development
- (Part 2)
- Contribution of the immune system to the progression of infection, autoimmunity, cancer or (neuro-) inflammation
- Modulation of the immune system as a potential therapeutic option
- Interaction of the microbiome with the immune system and impact of environmental factors on the development of immune-mediated diseases
- (Part 3)
- Oncogenic potential of viruses (e.g. Cervix carcinoma caused by HPV viruses)
- Molecular insights into carcinogenesis
- Preeclampsia and its immunological regulation
- (Part 4)
- Concept of cancer immunosurveillance and immunoeediting
- Current strategies for cancer immunotherapy
- Mechanisms of cancer therapy resistance
- Current strategies for cancer diagnosis and liquid biopsy
- (Part 5)
- Insights into antibiotic resistance (mode of antibiotics, principles of antibiotic resistance)
- Emergence of multi-resistance and dissemination of plasmids causing multi-resistance
- Differences between susceptibility, tolerance, resistance and persistence of pathogens to antibiotics
- Current hypotheses of inducers for persister cell formation and medical treatment
- (Part 6)
- Neurovascular regulation in response to cerebral ischemia
- Molecular and cellular mechanisms of peripheral nerve regeneration

Recommended reading	Current literature on topics will be provided via Stud.IP	
Links		
Language of instruction	English	
Duration (semesters)	1 Semester	
Module frequency	winter semester	
Module capacity	25	
Type of module	Wahlpflicht / Elective	
Module level	MM (Mastermodul / Master module)	
Teaching/Learning method	Lecture	
Examination	Prüfungszeiten	Type of examination
Final exam of module		written examination (90 min.)
Type of course	Lecture	
SWS	4	
Frequency	WiSe	
Workload attendance time	56 h	

gsw100 - Immunology and Inflammation

Module label	Immunology and Inflammation			
Module code	gsw100			
Credit points	6.0 KP			
Workload	180 h			
Applicability of the module	<ul style="list-style-type: none"> • Master's Programme Molecular Biomedicine (Master) > Clinical Modules 			
Responsible persons	<ul style="list-style-type: none"> • Loser, Karin (module responsibility) • Loser, Karin (authorised to take exams) 			
Prerequisites	Enrolment in Master's programme Molecular Biomedicine			
Skills to be acquired in this module	<p>Competencies:</p> <ul style="list-style-type: none"> ++ comprehensive understanding of the fundamentals of immunology and inflammation ++ deepened knowledge of clinical aspects of diseases ++ systematic understanding in the therapy diseases <ul style="list-style-type: none"> + interdisciplinary thinking + critical and analytical thinking ++ independent searching and knowledge of scientific literature ++ data presentation and discussion (written and spoken) ++ teamwork <ul style="list-style-type: none"> + time management 			
Module contents	<p>The module focuses on dermatology, immunology and inflammation.</p> <p>Lectures: Fundamentals of immunology and inflammation</p> <p>Seminars: Worked examples of major inflammatory diseases (e.g. allergies, infections, autoimmune diseases) and advanced therapeutic concepts.</p> <p>Exercises: Students will be expected to demonstrate the ability to prepare presentations in small working groups where they critically evaluate current research regarding specific examples of inflammatory diseases and their therapy (problem-orientated learning)</p>			
Recommended reading	<p>Textbooks: Janeway's Immunobiology; Authors: Kenneth Murphy, Casey Weaver; 2016 (9th Edition; Garland Science), Cellular and Molecular Immunology; Authors: Abul Abbas, Andrew H. Lichtman, Shiv Pillai; 2017 (9th Edition; Elsevier) Example review article: Siebenhaar F, Redegeld FA, Bischoff SC, Gibbs BF, Maurer M. Mast Cells as Drivers of Disease and Therapeutic Targets. Trends Immunol. 2018 Feb;39(2):151-162. doi: 10.1016/j.it.2017.10.005</p>			
Links	https://uol.de/dermatologie/forschung/			
Language of instruction	English			
Duration (semesters)	1 Semester			
Module frequency	First half of the winter semester			
Module capacity	25			
Type of module	Wahlpflicht / Elective			
Module level	MM (Mastermodul / Master module)			
Teaching/Learning method	Lecture, Seminar, Exercise			
Previous knowledge	basis knowledge in immunology			
Examination	Prüfungszeiten	Type of examination		
Final exam of module		graded: written examination (60 min, 60%), coursework (short review in English in the style "News and Views" article, 40%) ungraded: formative feedback given for presentations		
Type of course	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		1.5	WiSe	21
Seminar		1	WiSe	14
Exercises		1.5	WiSe	21

Type of course	Comment	SWS	Frequency	Workload of compulsory attendance
Total module attendance time				56 h

gsw110 - Clinical Aspects of Degenerative Diseases

Module label	Clinical Aspects of Degenerative Diseases			
Module code	gsw110			
Credit points	6.0 KP			
Workload	180 h			
Applicability of the module	<ul style="list-style-type: none"> • Master's Programme Molecular Biomedicine (Master) > Clinical Modules 			
Responsible persons	<ul style="list-style-type: none"> • Zieschang, Tania (module responsibility) • Dewald, Oliver (module responsibility) • Zieschang, Tania (authorised to take exams) • Koschate-Storm, Jessica (authorised to take exams) • Mellert, Friedrich (authorised to take exams) • Ort, Katharina (authorised to take exams) • Hoppe, Florian (authorised to take exams) 			
Prerequisites	Enrolment in Master's programme Molecular Biomedicine			
Skills to be acquired in this module	<p>Competencies:</p> <p>++ comprehensive understanding of clinical manifestation, epidemiology, risk factors, treatment strategies of degenerative diseases</p> <p>++ understanding of geriatric phenomena</p> <p>++ understanding and application of the comprehensive geriatric assessment (CGA)</p> <p>++ interdisciplinary thinking</p> <p>++ ethics and professional behaviour</p> <p>++ critical and analytical thinking</p> <p>+ independent searching and knowledge of scientific literature</p> <p>++ data presentation and discussion (written and spoken)</p> <p>++ teamwork</p>			
Module contents	<p>The module focuses on geriatric medicine.</p> <p>Lecture: fundamentals of degenerative diseases (Alzheimer's disease, Parkinson's disease, Rheumatoid Arthritis, Osteoarthritis, heart valve disease, aortic dilatation) and geriatric phenomena as frailty, multimorbidity and polypharmacy and their impact on diagnostic and treatment options, basics of geriatric medicine, evidence of the impact of the CGA on patient outcomes, dimensions of the CGA, surgical and interventional heart procedures in geriatric patients</p> <p>Seminar: instant ageing, the geriatric team, cognitive assessment with actors, work in heart team</p> <p>Excursion: small groups (2 students) can accompany clinical rounds on the geriatric ward (either acute geriatric care or geriatric rehabilitation). Conduction of parts of the CGA with patients</p>			
Recommended reading	Textbooks on geriatric medicine and geriatric psychiatry, e.g. Zeyfang et al. Basiswissen Medizin des Alterns und des alten Menschen. Springer. Textbooks on cardiac surgery and cardiology, e.g. Ziemer, Haverich: Herzchirurgie. Scientific papers related to current research topics will be available in Stud.IP			
Links	https://www.aortenklappenregister.de/publikationen-des-registers.html			
Language of instruction	English			
Duration (semesters)	1 Semester			
Module frequency	First half of the winter semester			
Module capacity	20			
Type of module	Wahlpflicht / Elective			
Module level	MM (Mastermodul / Master module)			
Teaching/Learning method	Lecture, Seminar, Excursion			
Previous knowledge	physiology and cardiovascular system			
Examination	Prüfungszeiten	Type of examination		
Final exam of module	written examination (60 min, 50%), case presentation (50%)			
Type of course	Comment	SWS	Frequency	Workload of compulsory attendance

Type of course	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		1.5	WiSe	28
Seminar		1.5	WiSe	21
Exercises		1	WiSe	14
Total module attendance time				63 h

gsw120 - Tumor Biology

Module label	Tumor Biology
Module code	gsw120
Credit points	6.0 KP
Workload	180 h
Applicability of the module	<ul style="list-style-type: none"> Master's Programme Molecular Biomedicine (Master) > Clinical Modules
Responsible persons	<ul style="list-style-type: none"> Dübbel, Lena (module responsibility) Dübbel, Lena (authorised to take exams) Loser, Karin (authorised to take exams)
Prerequisites	Enrolment in Master's programme Molecular Biomedicine
Skills to be acquired in this module	<p>Goals of the Module: Upon successful completion of this module, students</p> <ul style="list-style-type: none"> - can define and identify oncogenes and tumor suppressor genes - know about the hallmarks of cancer and can explain them based on example pathways and traits - know about the complexity of the tumor tissue and the different cells that are involved - know about the principles of metastasis. <p>Competencies: ++ deepened biological & clinical expertise ++ interdisciplinary thinking + deepened knowledge of biological working methods & clinical diagnostics ++ data analysis skills + usage of databases and computational tools ++ critical & analytical thinking + independent searching & knowledge of scientific literature ++ data presentation & discussion (written and spoken) + teamwork ++ ethics & professional behavior</p>
Module contents	<p>Part 1 - Lecture: We will give a brief overview of several aspects of tumor biology: Types of mutation, hallmarks of cancer, tumor as a tissue, metastasis, oncogenes and tumor suppressor genes, signal transduction and many example pathways that are important for cancer progression. In addition, you will learn about tumor-infiltrating immune cells and new therapy options like tumor-immune therapy.</p> <p>Part 2 - Seminar: Students will be expected to demonstrate the ability to prepare presentations in small working groups where they critically evaluate current research regarding specific examples of tumor diseases and their therapy (problem-orientated learning)</p> <p>Optional: Lectures from the study programme Human Medicine (winter semester only; will be held in German): Lecture topics from the human Medicine programme focusses on large tumor entities, therapy strategies, and basics of carcinogenesis and therapeutic implementation. Please note, that these lectures are not part of the curriculum and are therefore not relevant for the examinations.</p>
Recommended reading	<p>Current literature will be uploaded on Stud.IP. Previous literature research is not necessary.</p> <p>If you are looking for more information/background: Weinberg; "The Biology of Cancer"; Garland Science</p>
Links	
Language of instruction	English
Duration (semesters)	1 Semester
Module frequency	Semester break after winter term, annually
Module capacity	25
Reference text	The number of participants for this module is limited to 25. If there are more students registered than places available, lots will be drawn. Students which are enrolled in Master's programme Molecular Biomedicine will be preferred.
Type of module	Wahlpflicht / Elective
Module level	MM (Mastermodul / Master module)
Previous knowledge	Basic knowledge of genetics, cell biology and biochemistry

Examination	Prüfungszeiten	Type of examination		
Final exam of module		written examination (60 min., 75%), presentation (25%)		
Type of course	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		2	SuSe and WiSe	28
Seminar		2	SuSe and WiSe	28
Total module attendance time				56 h

gsw130 - Regenerative Medicine in Ophthalmology

Module label	Regenerative Medicine in Ophthalmology			
Module code	gsw130			
Credit points	6.0 KP			
Workload	180 h			
Applicability of the module	<ul style="list-style-type: none"> • Master's Programme Molecular Biomedicine (Master) > Clinical Modules 			
Responsible persons	<ul style="list-style-type: none"> • Mertsch, Sonja (module responsibility) • Mertsch, Sonja (authorised to take exams) • Schrader, Stefan (authorised to take exams) 			
Prerequisites	Enrolment in Master's programme Molecular Biomedicine			
Skills to be acquired in this module	<p>Competencies:</p> <p>++ comprehensive understanding of the fundamentals of regenerative research ++ deepened knowledge of clinical aspects of eye diseases ++ deepened knowledge of biological lab methods and clinical diagnostics (classical tissue engineering, cell culture and molecular laboratory methods) ++ systematic understanding in translational research + interdisciplinary thinking + critical and analytical thinking ++ data analysis and interpretation skills ++ data presentation and discussion (written and spoken) ++ teamwork</p>			
Module contents	<p>The module focuses on regenerative medicine in ophthalmology.</p> <p>Lectures: Fundamentals of ophthalmologic diseases and insights of current ophthalmologic research projects including tissue engineering methods</p> <p>Exercises: Practical laboratory work: generation of tissue engineered artificial cornea, preparation of porcine cornea and retina, cultivation of primary corneal stem cells, sample preparation for protein and mRNA, Western Blotting, PCR, Paraffin sectioning, HE-staining</p>			
Recommended reading	Textbooks of ophthalmology, anatomy, current literature concerning tissue engineering methods in ophthalmology. Primary and secondary literature of the field will be provided and introduced at the first meeting.			
Links	https://uol.de/augenheilkunde			
Language of instruction	English			
Duration (semesters)	1 Semester			
Module frequency	winter semester			
Module capacity	5			
Reference text	The number of participants is limited to 5. Students which are enrolled in Master's programme Molecular Biomedicine will be preferred.			
Type of module	Wahlpflicht / Elective			
Module level	MM (Mastermodul / Master module)			
Teaching/Learning method	Lecture and Exercise			
Previous knowledge	basic knowledge of cell culture methods, protein and mRNA isolation methods			
Examination	Prüfungszeiten	Type of examination		
Final exam of module		protocol (30%) and presentation (70%)		
Type of course	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		1	WiSe	14
Exercises		3	WiSe	42
Total module attendance time				56 h

Research Modules

gsw150 - Research Project Molecular Biomedicine

Module label	Research Project Molecular Biomedicine	
Module code	gsw150	
Credit points	15.0 KP	
Workload	450 h	
Applicability of the module	<ul style="list-style-type: none"> • Master's Programme Molecular Biomedicine (Master) > Research Modules 	
Responsible persons	<ul style="list-style-type: none"> • Koch, Karl-Wilhelm (module responsibility) • Koch, Karl-Wilhelm (authorised to take exams) 	
Further responsible persons	all teachers of the curriculum (module counselling, authorized examiners)	
Prerequisites	as defined in the admission and examination regulations	
Skills to be acquired in this module	<p>Competencies:</p> <ul style="list-style-type: none"> ++ deepened biological and / or clinical expertise ++ deepened knowledge of biological working methods and / or clinical diagnostics ++ data analysis skills <ul style="list-style-type: none"> + interdisciplinary thinking ++ critical and analytical thinking ++ independent searching and knowledge of scientific literature ++ ability to perform independent biological research ++ data presentation and discussion (written and spoken) <ul style="list-style-type: none"> + team work + ethics and professional behaviour + project and time management 	
Module contents	<p>Emphasis on research</p> <p>Theory and practice of topics related to issues in molecular biomedicine; independent treatment of an individual project; acquiring an advanced theoretical knowledge in selected fields of the molecular biology of the cell (points of emphasis: genetics, biochemistry, cell biology; topics depending on research groups)</p> <p>There are several options for the lab projects, for example in the broad categories of:</p> <ul style="list-style-type: none"> https://uol.de/en/neurosciences/ https://uol.de/en/biochemistry/research/ https://uol.de/en/neurogenetics/research/ https://uol.de/en/retina/research/ https://uol.de/humanmedizin/ https://uol.de/anatomie/forschung/ https://uol.de/dermatologie/forschung/ https://uol.de/immologie/aktuelle-forschungsprojekte https://uol.de/humangenetik/research-and-clinical-collaborations/ https://uol.de/genetik-gehirnfehlbildungen/forschungsschwerpunkte/ https://uol.de/augenheilkunde/forschungsschwerpunkte 	
Recommended reading	Specific literature of the topics indicated above; original papers related to the current research question; will be different for every student and every year.	
Links		
Language of instruction	English	
Duration (semesters)	1 Semester	
Module frequency	every semester, time is flexible and subject to individual arrangement	
Module capacity	unlimited	
Type of module	Wahlpflicht / Elective	
Module level	MM (Mastermodul / Master module)	
Teaching/Learning method	Lecture and Project	
Previous knowledge	basic knowledge of cell biology, genetics, biochemistry or clinical biomedicine	
Examination	Prüfungszeiten	Type of examination
Final exam of module	graded: project report ungraded: participation in seminar and 30 min. presentation	

Type of course	Comment	SWS	Frequency	Workload of compulsory attendance
Seminar		2	SuSe or WiSe	28
Project (Individuelles Forschungsprojekt)		8	SuSe or WiSe	112
Total module attendance time				140 h

gsw160 - External Research Project Molecular Biomedicine

Module label	External Research Project Molecular Biomedicine			
Module code	gsw160			
Credit points	15.0 KP			
Workload	450 h			
Applicability of the module	<ul style="list-style-type: none"> • Master's Programme Molecular Biomedicine (Master) > Research Modules 			
Responsible persons	<ul style="list-style-type: none"> • Koch, Karl-Wilhelm (module responsibility) • Koch, Karl-Wilhelm (authorised to take exams) 			
Further responsible persons	all teachers of the curriculum (module counselling, authorized examiners)			
Prerequisites	as defined in the admission and examination regulations			
Skills to be acquired in this module	<p>Competencies:</p> <ul style="list-style-type: none"> ++ deepened biological and / or clinical expertise ++ deepened knowledge of biological working methods and / or clinical diagnostics ++ data analysis skills <ul style="list-style-type: none"> + interdisciplinary thinking ++ critical and analytical thinking ++ independent searching and knowledge of scientific literature ++ ability to perform independent biological research ++ data presentation and discussion (written and spoken) <ul style="list-style-type: none"> + team work + ethics and professional behaviour + project and time management 			
Module contents	<p>Emphasis on research</p> <p>Theory and practice of topics related to issues in molecular biomedicine; independent treatment of an individual project; acquiring an advanced theoretical knowledge in selected fields of the molecular biology of the cell (points of emphasis: genetics, biochemistry, cell biology; topics depending on research groups).</p>			
Recommended reading	Specific literature of the topics indicated above; original papers related to the current research question; will be different for every student and every year.			
Links				
Language of instruction	English			
Duration (semesters)	1 Semester			
Module frequency	every semester, time is flexible and subject to individual arrangement			
Module capacity	unlimited			
Type of module	Wahlpflicht / Elective			
Module level	MM (Mastermodul / Master module)			
Teaching/Learning method	Seminar and Project			
Previous knowledge	basic knowledge of cell biology, genetics, biochemistry or clinical biomedicine			
Examination	Prüfungszeiten	Type of examination		
Final exam of module		graded: project report ungraded: participation in seminar and 30 min. presentation		
Type of course	Comment	SWS	Frequency	Workload of compulsory attendance
Seminar		2	SuSe or WiSe	28
Project (Individuelles Forschungsprojekt)		8	SuSe or WiSe	112
Total module attendance time				140 h

Skills Modules

gsw170 - Research Techniques Molecular Biomedicine

Module label	Research Techniques Molecular Biomedicine			
Module code	gsw170			
Credit points	6.0 KP			
Workload	180 h			
Applicability of the module	<ul style="list-style-type: none"> • Master's Programme Molecular Biomedicine (Master) > Skills Modules 			
Responsible persons	<ul style="list-style-type: none"> • Hartmann, Anna-Maria (module responsibility) • Hartmann, Anna-Maria (authorised to take exams) 			
Prerequisites	Enrolment in Master's programme Molecular Biomedicine			
Skills to be acquired in this module	<p>Competencies:</p> <ul style="list-style-type: none"> ++ deepened knowledge of biological working methods + deepened knowledge of clinical diagnostics ++ data analysis skills + interdisciplinary thinking ++ critical and analytical thinking ++ ability to perform independent biological research ++ data presentation and discussion (written and spoken) <p>Basic knowledge of techniques used in molecular biomedicine</p>			
Module contents	<p>The module focuses on competence in research methods.</p> <p>Seminar: Hybridization and detection of nucleic acid, polymerase chain reaction, nucleic acid sequencing, analyses of epigenetic modifications, protein-nucleic acid Interaction, immunological techniques, light microscopy techniques, mass spectrometry analyses, protein-protein interactions, fluorescence <i>in situ</i> hybridization</p> <p>Exercise: molecular biological techniques (PCR, agarose gel, plasmid preparation, restriction), immunological methods (cell culturing, cytochemistry), biochemistry techniques (SDS gel, western blotting, protein purification, photometry)</p>			
Recommended reading	Bioanalytics: Analytical Methods and Concepts in Biochemistry and Molecular Biology, Lottspeich and Engels (ISBN-13: 978-3527339198).			
Links				
Language of instruction	English			
Duration (semesters)	1 Semester			
Module frequency	Second half of the winter semester; annually			
Module capacity	25			
Type of module	Wahlpflicht / Elective			
Module level	MM (Mastermodul / Master module)			
Teaching/Learning method	Seminar and Exercise			
Examination	Prüfungszeiten		Type of examination	
Final exam of module			graded; presentation (20 min.) ungraded: signed protocols	
Type of course	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		2	WiSe	28
Practical training		2	WiSe	28
Total module attendance time				56 h

gsw180 - Ethics in Medicine

Module label	Ethics in Medicine		
Module code	gsw180		
Credit points	3.0 KP		
Workload	90 h		
Applicability of the module	<ul style="list-style-type: none"> • Master's Programme Molecular Biomedicine (Master) > Skills Modules 		
Responsible persons	<ul style="list-style-type: none"> • Schweda, Mark (module responsibility) • Schweda, Mark (authorised to take exams) • Weßel, Merle (authorised to take exams) 		
Prerequisites	Enrolment in Master's programme Molecular Biomedicine		
Skills to be acquired in this module	<p>Competencies:</p> <ul style="list-style-type: none"> ++ deepened medical / ethical expertise with a focus on research ethics ++ interdisciplinary thinking ++ critical and analytical thinking <ul style="list-style-type: none"> + independent searching and knowledge of scientific literature + ability to perform independent biological research ++ data presentation and discussion (written and spoken) <ul style="list-style-type: none"> + team work ++ ethics and professional behaviour <ul style="list-style-type: none"> + project and time management 		
Module contents	<p>Concept of ethics and central theoretical approaches to ethics Research ethical standards and their evolution Good scientific practice (scientific misconduct, criteria of authorship, documentation of research, IRB approval) Central areas of ethically sensitive research (stem cell and embryonic research, genomic research, clinical studies, social research) Ethical problems in research (research with incompetent and vulnerable populations)</p>		
Recommended reading	<p>Excerpts from relevant textbooks (e.g., Beauchamp, T., Childress, J. F. (2013): Principles of Biomedical Ethics; Emanuel, E. J., Grady, C. C., Crouch, R. A., Lie, R. K., Miller, F. G., Wendler, D. D. (eds.) (2008): The Oxford Textbook of Clinical Research Ethics; Hughes, J., Hunter, D., Sheehan, M., Wilkinson, S., Wrigley, A. (2010): European Textbook on Ethics in Research); current research articles</p>		
Links	https://uol.de/medizinethik/		
Language of instruction	English		
Duration (semesters)	1 Semester		
Module frequency	winter semester		
Module capacity	25		
Type of module	Wahlpflicht / Elective		
Module level	MM (Mastermodul / Master module)		
Teaching/Learning method	Lecture		
Examination	Prüfungszeiten	Type of examination	
Final exam of module		essay	
Type of course	Lecture and seminar		
SWS	2		
Frequency	WiSe		
Workload attendance time	28 h		

gsw190 - Journal Club

Module label	Journal Club	
Module code	gsw190	
Credit points	3.0 KP	
Workload	90 h	
Applicability of the module	<ul style="list-style-type: none"> • Master's Programme Molecular Biomedicine (Master) > Skills Modules 	
Responsible persons	<ul style="list-style-type: none"> • Mertsch, Sonja (module responsibility) • Mertsch, Sonja (authorised to take exams) • Maier, Esther Christine (authorised to take exams) • Schrader, Stefan (authorised to take exams) 	
Further responsible persons	all teachers of the curriculum	
Prerequisites	Enrolment in Master's programme Molecular Biomedicine. Neuroscience and Biology students can participate on request.	
Skills to be acquired in this module	<p>Competencies:</p> <ul style="list-style-type: none"> ++ reading and understanding of original scientific literature ++ deepened biological expertise ++ deepened knowledge of biological working methods ++ data analysis skills <ul style="list-style-type: none"> + interdisciplinary thinking ++ critical and analytical thinking ++ independent searching and knowledge of scientific literature <ul style="list-style-type: none"> + ability to perform independent biological research ++ data presentation and discussion (written and spoken) 	
Module contents	<p>The module focuses on current topics in molecular cell biology and biomedicine.</p> <p>Seminar topics: original literature of molecular life science related to health and disease</p>	
Recommended reading	publications related to the current research question	
Links		
Language of instruction	English	
Duration (semesters)	1 Semester	
Module frequency	winter and summer semester	
Module capacity	20	
Type of module	Wahlpflicht / Elective	
Module level	MM (Mastermodul / Master module)	
Teaching/Learning method	Seminar	
Previous knowledge	basic knowledge of cell biology, genetics, biochemistry	
Examination	Prüfungszeiten	Type of examination
Final exam of module		2 presentations
Type of course	Seminar	
SWS	2	
Frequency	SuSe and WiSe	
Workload attendance time	28 h	

gsw200 - Microscopic Imaging in Biomedical Sciences

Module label	Microscopic Imaging in Biomedical Sciences		
Module code	gsw200		
Credit points	3.0 KP		
Workload	90 h		
Applicability of the module	<ul style="list-style-type: none"> • Master's Programme Molecular Biomedicine (Master) > Skills Modules • Master's Programme Neuroscience (Master) > Skills Modules 		
Responsible persons	<ul style="list-style-type: none"> • Dedek, Karin (module responsibility) • Groß, Petra (authorised to take exams) • Dedek, Karin (authorised to take exams) • Solovyeva, Vita (authorised to take exams) 		
Prerequisites	Enrolment in Master's programmes Molecular Biomedicine and Neuroscience.		
Skills to be acquired in this module	Competencies: + deepened biological expertise ++ deepened knowledge of biological working methods + data analysis skills ++ interdisciplinary thinking ++ critical and analytical thinking ++ data presentation and discussion (written and spoken) + team work		
Module contents	The module focuses on microscopy, imaging and methods of microscopy. Lecture: Basics in optics, microscopy methods, image processing, biomedical applications Seminar: Examples for selected microscopy methods and their application. Different microscopical methods and their applications are discussed and compared. Students will understand the basics and limitations of microscopy methods and learn to evaluate them. Selected methods are demonstrated.		
Recommended reading	Literature will be provided during the lecture/seminar		
Links			
Language of instruction	English		
Duration (semesters)	1 Semester		
Module frequency	afternoon event during winter semester		
Module capacity	16 (Selection criteria: attendance at first meeting)		
Type of module	Wahlpflicht / Elective		
Module level	MM (Mastermodul / Master module)		
Teaching/Learning method	Lecture and Seminar		
Previous knowledge	basic physics, basic cell biology		
Examination	Prüfungszeiten	Type of examination	

Final exam of module

graded: written examination (60 min.),
 ungraded: presentation

Note: to qualify for the exam, regular participation during the semester is mandatory, no more than 2 days of absence

Type of course	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		1	WiSe	14
Seminar		1	WiSe	14
Total module attendance time				28 h

neu751 - Laboratory Animal Science

Module label	Laboratory Animal Science
Module code	neu751
Credit points	3.0 KP
Workload	90 h (one week full-time in semester break + flexible time for studying and exam preparation 1 SWS Lecture total workload 45h: 2h contact / 20h background reading / 23h exam preparation 1 SWS Supervised exercise total workload 45h: 35h contact / 10h background reading)
Applicability of the module	<ul style="list-style-type: none">• Master's Programme Biology (Master) > Skills Modules• Master's Programme Biology (Master) > Skills Modules• Master's Programme Molecular Biomedicine (Master) > Skills Modules• Master's Programme Neuroscience (Master) > Skills Modules
Responsible persons	<ul style="list-style-type: none">• Langemann, Ulrike (authorised to take exams)• Winklhofer, Michael (authorised to take exams)• Nolte, Arne (authorised to take exams)• Heyers, Dominik (authorised to take exams)• Dedek, Karin (authorised to take exams)• Schmaljohann, Heiko (authorised to take exams)• Helgers, Simeon (module responsibility)
Prerequisites	none
Skills to be acquired in this module	<p>++ Expt. Methods + Independent Research + Scient. Literature ++ Social skills ++ Interdiscipl. knowl g + Scientific English ++ Ethics</p> <p>Upon successful completion of this course, students</p> <ul style="list-style-type: none">• know the relevant EU legislation governing animal welfare and are able to explain its meaning in common language• understand and are able to critically discuss salient ethical concepts in animal experimentation, such as the three Rs and humane endpoint.• have basic knowledge of the biology and husbandry of laboratory animal species held at the University of Oldenburg (rodents or birds or fish)• are able to critically assess the needs and welfare of animals without compromising scientific integrity of the investigation• have practical skills in handling small rodents or birds or fish• have profound knowledge of anaesthesia, analgesia and basic principles of surgery.• have practised invasive procedures and euthanasia. <p>NOTE: These objectives aim to satisfy the requirements for EU directive A „Persons carrying out animal experiments“ and EU directive D „Persons killing animals“.</p>
Module contents	<p>Background knowledge is taught using the third-party online platform "LAS Interactive" which concludes with a written exam that has to be passed before the practical part. Topics covered are:</p> <ul style="list-style-type: none">• Legislation, ethics and the 3Rs• Scientific integrity• Data collection "• Basic biology of rodents, birds and fish• Husbandry, and nutrition of rodents, birds and fish• Animal Welfare• Health monitoring• Pain and distress• Euthanasia <p>Practical procedures will first be demonstrated, important aspects will then be practiced under supervision by every participant, on an animal model of their</p>

choice (rodents, birds or fish):

- Handling and external examination
- Administration of substances, blood sampling
- Euthanasia and dissection
- Transcardial perfusion
- Anaesthesia and surgery

Recommended reading	"LAS interactive" internet-based learning platform			
Links				
Language of instruction	English			
Duration (semesters)	1 Semester			
Module frequency	semester break, every semester			
Module capacity	20 (Registration procedure / selection criteria: StudIP, sequence of registration)			
Examination	Prüfungszeiten			Type of examination
Final exam of module	immediately before the practical part		written exam of 90 minutes	
Type of course	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		1	SuSe and WiSe	14
Exercises		1	SuSe and WiSe	14
Total module attendance time				28 h

neu760 - Scientific English

Module label	Scientific English	
Module code	neu760	
Credit points	6.0 KP	
Workload	180 h (0,5 SWS Lecture (VO) Total workload 23h: 8h contact / 15h research for term paper 3,5 SWS Supervised exercise (UE) Total workload 158h: 46h contact / 46h preparation of texts and presentations / 66h term paper)	
Applicability of the module	<ul style="list-style-type: none"> • Master's Programme Biology (Master) > Skills Modules • Master's Programme Biology (Master) > Skills Modules • Master's Programme Molecular Biomedicine (Master) > Skills Modules • Master's Programme Neuroscience (Master) > Skills Modules 	
Responsible persons	<ul style="list-style-type: none"> • Albert, Jörg (module responsibility) • Albert, Jörg (authorised to take exams) 	
Prerequisites	non-native speakers	
Skills to be acquired in this module	+ Neurosci. knowlg. ++ Social skills ++ Data present./disc. ++ Scientific English Upon completion of this course, students <ul style="list-style-type: none"> • have increased their proficiency in different forms of scientific presentation and communication in English, with special emphasis on neuroscience • are able to express themselves with correct sentence structure and grammar, correct use of idioms and correct pronunciation • are proficient in different contexts of scientific communication (e.g., paper, poster and informal exchange by email or phone) • are able to recognize and avoid common errors of non-native speakers. 	
Module contents	Lectures cover - characteristics of the different forms of scientific presentations - sentence structure using the passive voice - scientific vocabulary and terminology as contrasted to common speech - appropriate language for communication with scientific editors and referees Students read neuroscience texts of an advanced level and practice explaining and presenting these in both written and oral form. They also practice different contexts of scientific communication (e.g., paper, poster and informal exchange by email or phone). Emphasis is placed on individual problems in pronunciation and language use errors.	
Recommended reading	http://users.wpi.edu/~nab/sci_eng/ScientificEnglish.pdf	
Links		
Language of instruction	English	
Duration (semesters)	1 Semester	
Module frequency	annually, semester break	
Module capacity	12	
Reference text	Usually held in the break before summer term Outsourced to STELS-OL (Scientific and Technical English Language Service); native English speaker with in-depth neuroscience knowlg.	
Previous knowledge	minimum English level B2 (C1 preferred) according to Common European Framework of Reference for Languages (CEFR) priority to non-native speakers, higher semester	
Examination	Prüfungszeiten	Type of examination
Final exam of module	within 2 months of completing the course	Portfolio: 70% several quick tests, texts, presentations, 30% term paper Bonus system for active participation

Type of course	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		0.5	WiSe	7
Exercises		3.5	WiSe	49
Total module attendance time				56 h

gsw210 - Scientific Communication

Module label	Scientific Communication	
Module code	gsw210	
Credit points	6.0 KP	
Workload	180 h	
Applicability of the module	<ul style="list-style-type: none"> • Master's Programme Molecular Biomedicine (Master) > Skills Modules 	
Responsible persons	<ul style="list-style-type: none"> • Plösch, Torsten (module responsibility) • Plösch, Torsten (authorised to take exams) • Dömer, Patrick (authorised to take exams) • Dittmann, Tim (authorised to take exams) • Geismann, Claudia (authorised to take exams) 	
Prerequisites	Enrolment in Master's programme Molecular Biomedicine	
Skills to be acquired in this module	<p>Goals of the module: Upon completion of this module, students</p> <ul style="list-style-type: none"> - have improved their competencies in scientific writing - demonstrate effective communication and presentation skills (oral and written) - can defend their findings in scientific discussions or rebuttal letters - know about major communication pitfall <p>Competencies: ++ scientific writing ++ data presentation and discussion + independent searching and knowledge of scientific literature + teamwork + critical and analytical thinking</p>	
Module contents	<p>Seminar:</p> <ul style="list-style-type: none"> - Introduction to scientific writing (analysis of scientific publications, structure of publications, common mistakes, logical story plots) - types of scientific communications: posters, oral presentations, journal papers, grant applications, CV/job application - Literature management (information search/ literature management tools/ plagiarism) - presentation techniques (how to structure your poster/presentation, how to reach your audience) - how to write your Master's thesis - job application (CV, application letter) - how do others perceive your message? - "don'ts" of scientific communication - social media for scientists - the perfect abstract <p>Exercise</p> <ul style="list-style-type: none"> - analysis of scientific publications - writing an abstract - presentation (poster, short talk) 	
Recommended reading	A list will be distributed on forehand	
Links		
Language of instruction	English	
Duration (semesters)	1 Semester	
Module frequency	winter term	
Module capacity	12	
Reference text	The number of participants for this module is limited to 12. If there are more students registered than places available, lots will be drawn. Students which are enrolled in Master's programme Molecular Biomedicine will be preferred.	
Type of module	Wahlpflicht / Elective	
Module level	MM (Mastermodul / Master module)	
Teaching/Learning method	Seminar and Exercise	
Previous knowledge	English level B2 according to Common European Framework of Reference for Languages (CEFR)	
Examination	Prüfungszeiten	Type of examination
Final exam of module	during seminar	portfolio (presentation, several exercises, active participation during discussions)

Type of course Seminar and exercise

SWS 4

Frequency SuSe or WiSe

Workload attendance time 56 h

gsw220 - Bioinformatics and Omics

Module label	Bioinformatics and Omics		
Module code	gsw220		
Credit points	6.0 KP		
Workload	180 h		
Applicability of the module	<ul style="list-style-type: none"> • Master's Programme Molecular Biomedicine (Master) > Skills Modules 		
Responsible persons	<ul style="list-style-type: none"> • Hitz, Marc-Phillip (module responsibility) • Geldon, Laura (authorised to take exams) • Audain Martinez, Enrique (authorised to take exams) • Perez Riverol, Amilcar (authorised to take exams) 		
Prerequisites	Enrolment in Master's programme Molecular Biomedicine		
Skills to be acquired in this module			
Module contents			
Recommended reading	literature will be provided during the lecture/seminar; a list will be distributed on forehand		
Links			
Languages of instruction			
Duration (semesters)	1 Semester		
Module frequency			
Module capacity	25		
Examination	Prüfungszeiten	Type of examination	
Final exam of module	will be announced in class; at the end of the course	Portfolio (exercises, active participation during discussions)	
Type of course	Comment	SWS	Workload of compulsory attendance
Seminar and exercise		2	28
Lecture		2	28
Total module attendance time			56 h

gsw215 - Introduction to Academic Writing

Module label	Introduction to Academic Writing		
Module code	gsw215		
Credit points	3.0 KP		
Workload	90 h (Seminar 1SWS Übung 1SWS)		
Applicability of the module	<ul style="list-style-type: none"> • Master's Programme Molecular Biomedicine (Master) > Skills Modules 		
Responsible persons	<ul style="list-style-type: none"> • Helgers, Simeon (module responsibility) • Dömer, Patrick (authorised to take exams) • Helgers, Simeon (authorised to take exams) 		
Prerequisites	Enrolment in Master's programme Molecular Biomedicine		
Skills to be acquired in this module	<p>Goals of this module: Upon successful completion of this module, students are familiar with the basic principles of academic practice including academic writing, data analysis, data presentation and general rules regarding ethics and laws.</p> <p>Skills to be acquired/ competencies: ++ independent searching and knowledge of scientific literature ++ ethics and professional behavior ++ data presentation and discussion (written and spoken) ++ data analysis skills + deepened knowledge of biological working methods + critical and analytical thinking + interdisciplinary thinking + teamwork</p>		
Module contents	<p>The module focuses on the basic principles of academic practice. In theoretical and practical parts, the students will</p> <ul style="list-style-type: none"> - learn how to structure and write protocols, articles, and thesis. - be introduced to general guidelines, plagiarism, national and international guidelines and good scientific practice. - learn how to manage, analyze, and present data sets in written and spoken form. - learn to work with scientific images/plots etc. - be introduced to application writing (ethic approvals, grand applications etc.) - learn about authorship and the process of publications. <p>The module will consist of lectures and practical parts consisting of lab work, data analysis and writing assignments.</p>		
Recommended reading			
Links			
Language of instruction	English		
Duration (semesters)	1 Semester		
Module frequency			
Module capacity	25		
Examination	Prüfungszeiten	Type of examination	
Final exam of module		PF Portfolio: (presentation, written protocol, active participation) - ungraded	
Type of course	Comment	SWS	Frequency
			Workload of compulsory attendance
Seminar		1	SuSe or WiSe
Exercises		1	SuSe or WiSe
Total module attendance time			0 h

Master's Degree Module

mam - Master's Thesis Module

Module label	Master's Thesis Module	
Module code	mam	
Credit points	30.0 KP	
Workload	900 h (attendance in the lab meetings: 28 hours (2 SWS); these work: 872 hours)	
Applicability of the module	<ul style="list-style-type: none"> • Master's Programme Molecular Biomedicine (Master) > Master's Degree Module 	
Responsible persons		
Further responsible persons	all teachers of the curriculum	
Prerequisites	as defined in the admission and examination regulations	
Skills to be acquired in this module	++ deepened biological and / or clinical expertise, ++ deepened knowledge of biological working methods and / or clinical diagnostics, ++ data analysis skills, + interdisciplinary thinking, ++ critical and analytical thinking, ++ independent searching and knowledge of scientific literature, ++ ability to perform independent biological research, ++ data presentation and discussion (written and spoken), + team work, + ethics and professional behaviour, ++ project and time management	
Module contents	Preparation of the Master Thesis. There are several options for the lab projects, e.g. in the broad categories of: https://uol.de/en/neurosciences/ o https://uol.de/en/biochemistry/research/ o https://uol.de/en/neurogenetics/research/ o https://uol.de/en/retina/research/ https://uol.de/humanmedizin/ o https://uol.de/anatomie/forschung/ o https://uol.de/dermatologie/forschung/ o https://uol.de/humangenetik/research-and-clinical-collaborations/ https://uol.de/genetik-gehirnfehlbildungen/forschungsschwerpunkte/	
Recommended reading	Specific literature of the topics indicated above; original papers related to the current research question	
Links		
Language of instruction	English	
Duration (semesters)	1 Semester	
Module frequency	recommended in semester 4, time is flexible and subject to individual arrangement	
Module capacity	unlimited	
Type of module	Pflicht / Mandatory	
Module level	Abschlussmodul (Abschlussmodul / Conclude)	
Examination	Prüfungszeiten	Type of examination
Final exam of module		Master Thesis (90%), oral presentation (colloquium, 10%)
Type of course	Colloquium	
SWS	2	

Frequency	SuSe or WiSe
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Workload attendance time	28 h
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