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**Modulhandbuch**

**Molecular Biomedicine - Master's Programme**

**im Summer semester 2024**

erstellt am 02/05/24

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## Background Modules

### bio605 - Molecular Genetics and Cell Biology

<b>Module label</b>	Molecular Genetics and Cell Biology		
<b>Modulkürzel</b>	bio605		
<b>Credit points</b>	12.0 KP		
<b>Workload</b>	360 h		
<b>Verwendbarkeit des Moduls</b>	<ul style="list-style-type: none"> <li>Master's Programme Biology (Master) &gt; Background Modules</li> <li>Master's Programme Biology (Master) &gt; Background Modules</li> <li>Master's Programme Molecular Biomedicine (Master) &gt; Background Modules</li> <li>Master's Programme Neuroscience (Master) &gt; Background Modules</li> </ul>		
<b>Zuständige Personen</b>	<ul style="list-style-type: none"> <li>Neidhardt, John (module responsibility)</li> <li>Neidhardt, John (Prüfungsberechtigt)</li> <li>Koch, Karl-Wilhelm (Prüfungsberechtigt)</li> <li>Jüschke, Christoph (Prüfungsberechtigt)</li> </ul>		
<b>Prerequisites</b>	BSc (Biologie, Biochemie)		
<b>Skills to be acquired in this module</b>	<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>		
<b>Module contents</b>	<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>		
<b>Literatureempfehlungen</b>	Textbooks of Cell Biology		
<b>Links</b>	<a href="http://www.uni-oldenburg.de/humangenetik/">http://www.uni-oldenburg.de/humangenetik/</a>		
<b>Language of instruction</b>	English		
<b>Duration (semesters)</b>	1 Semester		
<b>Module frequency</b>	winter term		
<b>Module capacity</b>	15		
<b>Reference text</b>	associated with bio900		
<b>Type of module</b>	Wahlpflicht / Elective		
<b>Module level</b>	MM (Mastermodul / Master module)		
<b>Teaching/Learning method</b>	Lecture, seminar, exercise		
<b>Previous knowledge</b>	Basic knowledge in cell biology, genetics, biochemistry		
<b>Examination</b>	<b>Prüfungszeiten</b>	<b>Type of examination</b>	
<b>Final exam of module</b>		written examination (70 %), paper(s) presentation 30 %; not graded: signed lab protocols, regular active participation is required for the module to be passed.	
<b>Lehrveranstaltungsform</b>	<b>Comment</b>	<b>SWS</b>	<b>Frequency</b>
Lecture		2	WiSe
Seminar		1	WiSe
			<b>Workload of compulsory attendance</b>
			28
			14

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Lehrveranstaltungsform	Comment	SWS	Frequency	Workload of compulsory attendance
Exercises		5	WiSe	70
<b>Präsenzzeit Modul insgesamt</b>				<b>112 h</b>

## bio695 - Biochemical concepts in signal transduction

Module label	Biochemical concepts in signal transduction			
Modulkürzel	bio695			
Credit points	12.0 KP			
Workload	360 h			
Verwendbarkeit des Moduls	<ul style="list-style-type: none"><li>• Master's Programme Biology (Master) &gt; Background Modules</li><li>• Master's Programme Biology (Master) &gt; Background Modules</li><li>• Master's Programme Molecular Biomedicine (Master) &gt; Background Modules</li><li>• Master's Programme Neuroscience (Master) &gt; Background Modules</li></ul>			
Zuständige Personen	<ul style="list-style-type: none"><li>• Koch, Karl-Wilhelm (module responsibility)</li><li>• Koch, Karl-Wilhelm (Prüfungsberechtigt)</li><li>• Scholten, Alexander (Prüfungsberechtigt)</li><li>• Scholten, Alexander (Module counselling)</li></ul>			
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			
Literatureempfehlungen	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 examinaton (90 minutes) (50%), protocols (50%) Prerequisite for passing the module is active participation: Presentation(s) in the seminar		
Lehrveranstaltungsform	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		1	WiSe	14
Seminar		1	WiSe	14
Exercises		6	WiSe	84
Präsenzzeit Modul insgesamt				112 h

## gsw010 - Molecular Physiology

Module label	Molecular Physiology
Modulkürzel	gsw010
Credit points	6.0 KP
Workload	180 h
Verwendbarkeit des Moduls	<ul style="list-style-type: none"> <li>Master's Programme Molecular Biomedicine (Master) &gt; Background Modules</li> </ul>
Zuständige Personen	<ul style="list-style-type: none"> <li>Milenkovic, Ivan (module responsibility)</li> <li>Milenkovic, Ivan (Prüfungsberechtigt)</li> <li>Radulovic, Tamara (Prüfungsberechtigt)</li> <li>Keine, Christian (Prüfungsberechtigt)</li> <li>Radulovic, Tamara (Module counselling)</li> <li>Milenkovic, Ivan (Module counselling)</li> </ul>
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><b>Goals of the Module:</b> Upon successful completion of this module, students</p> <ul style="list-style-type: none"> <li>- know molecular mechanisms of cellular physiology</li> <li>- know physiology of the following human body organ systems: muscular system, nervous system, cardiovascular system, respiratory system, urinary system</li> <li>- understand pathophysiology of certain diseases</li> <li>- know basic principles of functional tests for certain organ systems.</li> </ul> <p><b>Competencies:</b> ++ 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><b>Lecture topics:</b> 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> <p><b>Exercise:</b> 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</p>
Literatureempfehlungen	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	<a href="https://uol.de/physiologie">https://uol.de/physiologie</a>
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.)		
Lehrveranstaltungsform	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		2	SoSe und WiSe	28
Practical training		2	SoSe und WiSe	28
Präsenzzeit Modul insgesamt				56 h



## gsw020 - Cellular and Subcellular Structures

Module label	Cellular and Subcellular Structures	
Modulkürzel	gsw020	
Credit points	6.0 KP	
Workload	180 h	
Verwendbarkeit des Moduls	<ul style="list-style-type: none"> <li>• Master's Programme Molecular Biomedicine (Master) &gt; Background Modules</li> </ul>	
Zuständige Personen	<ul style="list-style-type: none"> <li>• Bräuer, Anja (module responsibility)</li> <li>• Bräuer, Anja (Prüfungsberechtigt)</li> <li>• Maier, Esther Christine (Prüfungsberechtigt)</li> <li>• Maier, Esther Christine (Module counselling)</li> </ul>	
Prerequisites	Enrolment in Master's programme Molecular Biomedicine	
Skills to be acquired in this module	<p><b>Goals of the Module:</b> Upon successful completion of this module, students know and understand cellular and subcellular structures and their function in the human body.</p> <p><b>Competencies:</b>            ++ 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 <b>not</b> 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>	
Literatureempfehlungen	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	<a href="https://uol.de/anatomie/forschung/">https://uol.de/anatomie/forschung/</a>	
Language of instruction	English	
Duration (semesters)	1 Semester	
Module frequency	summer semester	
Module capacity	25	
Reference text	<p><b>For your notice:</b> this course will <b>NOT</b> cover microscopic imaging techniques, if you are interested please see module gsw200_Microscopic Imaging in Biomedical Sciences.</p>	
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.)	

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Lehrveranstaltungsform	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		2	SoSe	28
Exercises		2	SoSe	28
<b>Präsenzzeit Modul insgesamt</b>				56 h

## gsw030 - Biophysical Chemistry

Module label	Biophysical Chemistry			
Modulkürzel	gsw030			
Credit points	6.0 KP			
Workload	180 h			
Verwendbarkeit des Moduls	<ul style="list-style-type: none"><li>Master's Programme Molecular Biomedicine (Master) &gt; Background Modules</li></ul>			
Zuständige Personen	<ul style="list-style-type: none"><li>Winklhofer, Michael (module responsibility)</li><li>Winklhofer, Michael (Prüfungsberechtigt)</li></ul>			
Prerequisites	Enrolment in Master´s programme Molecular Biomedicine			
Skills to be acquired in this module	<p><b>Goals of the Module:</b> Upon successful completion of this module, students understand physical principles underlying biochemistry and cell biology.</p> <p><b>Competencies:</b> ++ 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>			
Literatureempfehlungen	<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	<a href="https://uol.de/en/biology/groups-our-research/sensory-biology-of-animals">https://uol.de/en/biology/groups-our-research/sensory-biology-of-animals</a>			
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%)			
Lehrveranstaltungsform	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		2	SoSe	28
Seminar		2	SoSe	28
Präsenzzeit Modul insgesamt				56 h

## gsw040 - Molecular and Cellular Biology of Hearing and Deafness

Module label	Molecular and Cellular Biology of Hearing and Deafness		
Modulkürzel	gsw040		
Credit points	12.0 KP		
Workload	360 h		
Verwendbarkeit des Moduls	<ul style="list-style-type: none"><li>• Master's Programme Molecular Biomedicine (Master) &gt; Background Modules</li></ul>		
Zuständige Personen	<ul style="list-style-type: none"><li>• Claußen, Maike (Prüfungsberechtigt)</li><li>• Ebbers, Lena (Prüfungsberechtigt)</li><li>• Ebbers, Lena (module responsibility)</li><li>• Claußen, Maike (module responsibility)</li></ul>		
Prerequisites	Enrolment in Master´s programme Molecular Biomedicine		
Skills to be acquired in this module	<b>Competencies:</b> ++ 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 (written and spoken)		
Module contents	<p>The module focuses on auditory neuroscience, molecular and cellular neurobiology.</p> <p><b>Lecture:</b> Development, anatomy and function of the auditory system (cochlea to cortex), classification, molecular causes and inheritance of auditory disorders, investigation of these disorders in animal models, insights into possibilities of treatment/therapy</p> <p><b>Seminar:</b> The seminar will focus on possibilities of treatment options in the field of auditory rehabilitation. In a flipped classroom, students will shortly present and discuss different approaches.</p> <p><b>Exercise:</b> Laboratory experiments to study mouse models of deafness/auditory processing disorders</p>		
Literatureempfehlungen	<p>Springer Handbook of Auditory Research Series Vol. 63: - Manley, G.A., Gummer, A.W., Popper, A.N., Fay, R.R. (Eds.), "Understanding the Cochlea", 2017, Springer - Oliver, D.L., Cant, N., Fay, R.R., Popper, A.N. (Eds.), "The Mammalian Auditory Pathways - Synaptic Organization and Microcircuits", 2018, Springer - Cramer, K.S., Coffin, A., Fay, R.R., Popper, A.N. (Eds.), "Auditory Development and Plasticity", 2017, Springer</p> <p>Jeremy M. Wolfe, Keith R. Kluender, Dennis M. Levi, Linda M. Bartoshuk, Rachel S. Herz, Roberta L. Klatzky, and Daniel M. Merfeld; "Sensation &amp; Perception", 2017, Sinauer</p> <p>Vona, B., Haaf, T. (Eds.), "Genetics of Deafness", 2016, Karger Publishers</p>		
Links	<a href="https://uol.de/en/neurogenetics/research/">https://uol.de/en/neurogenetics/research/</a>		
Language of instruction	English		
Duration (semesters)	1 Semester		
Module frequency	Second half of the summer semester		
Module capacity	8		
Reference text	The number of participants for this module is limited to 8. 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 and Exercise		
Previous knowledge	basic knowledge in genetics, molecular biology and cell biology		
Examination	Prüfungszeiten	Type of examination	

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Examination		Prüfungszeiten	Type of examination	
<b>Final exam of module</b>			presentation (50%), protocol (50%)	
Lehrveranstaltungsform	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		1	SoSe	14
Seminar		2	SoSe	28
Practical training		5	SoSe	70
<b>Präsenzzeit Modul insgesamt</b>				112 h

## gsw050 - Current Topics of Genetics

<b>Module label</b>	Current Topics of Genetics		
<b>Modulkürzel</b>	gsw050		
<b>Credit points</b>	6.0 KP		
<b>Workload</b>	180 h		
<b>Verwendbarkeit des Moduls</b>	<ul style="list-style-type: none"> <li>Master's Programme Molecular Biomedicine (Master) &gt; Background Modules</li> </ul>		
<b>Zuständige Personen</b>	<ul style="list-style-type: none"> <li>Ebbers, Lena (Prüfungsberechtigt)</li> <li>Ebbers, Lena (module responsibility)</li> </ul>		
<b>Prerequisites</b>	Enrolment in Master's programme Molecular Biomedicine		
<b>Skills to be acquired in this module</b>	<b>Competencies:</b> ++ 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 (written and spoken) + team work		
<b>Module contents</b>	<b>Lecture:</b> imparting of newest methods and "Hot Topics" in genetics (epigenetics, non-coding RNAs (also with reference to associated diseases)), genome editing, prospects and limitations of studying animal models/organoid cultures of human genetic disease, gene therapy, etc.  <b>Seminar:</b> reading/analyzing current literature in the field		
<b>Literatureempfehlungen</b>	Klug, Cummings, Spencer, Palladio, Killian, "Concepts of Genetics", Pearson, 2019 Strachan and Read, "Human molecular genetics", CRC Press, 2019 Current publications in genetics journals (e.g. Frontiers in Genetics, Trends in Genetics, PLOS Genetics, Nature Genetics, etc.)		
<b>Links</b>	<a href="https://uol.de/en/neurogenetics/research/">https://uol.de/en/neurogenetics/research/</a>		
<b>Language of instruction</b>	English		
<b>Duration (semesters)</b>	1 Semester		
<b>Module frequency</b>	Second half of the winter semester		
<b>Module capacity</b>	20		
<b>Type of module</b>	Wahlpflicht / Elective		
<b>Module level</b>	MM (Mastermodul / Master module)		
<b>Teaching/Learning method</b>	Lecture and Seminar		
<b>Previous knowledge</b>	basic knowledge in genetics		
Examination	Prüfungszeiten	Type of examination	
<b>Final exam of module</b>		graded: written examination (50%), portfolio (50%, concept paper and short presentation), ungraded: technical implementation of the concept paper (production of digital content for science communication (video/podcast))	
Lehrveranstaltungsform	Comment	SWS	Frequency
Lecture		2	SoSe
Seminar		2	SoSe
<b>Präsenzzeit Modul insgesamt</b>			56 h
			Workload of compulsory attendance

## neu141 - Visual Neuroscience - Physiology and Anatomy

<b>Module label</b>	Visual Neuroscience - Physiology and Anatomy
<b>Modulkürzel</b>	neu141
<b>Credit points</b>	12.0 KP
<b>Workload</b>	<p>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 )</p>
<b>Verwendbarkeit des Moduls</b>	<ul style="list-style-type: none"> <li>• Master's Programme Biology (Master) &gt; Background Modules</li> <li>• Master's Programme Biology (Master) &gt; Background Modules</li> <li>• Master's Programme Molecular Biomedicine (Master) &gt; Background Modules</li> <li>• Master's Programme Neuroscience (Master) &gt; Background Modules</li> </ul>
<b>Zuständige Personen</b>	<ul style="list-style-type: none"> <li>• Greschner, Martin (module responsibility)</li> <li>• Greschner, Martin (Prüfungsberechtigt)</li> <li>• Ahlers, Malte (Prüfungsberechtigt)</li> <li>• Dedek, Karin (Prüfungsberechtigt)</li> <li>• Dömer, Patrick (Prüfungsberechtigt)</li> </ul>
<b>Prerequisites</b>	Basic knowledge of neurobiology
<b>Skills to be acquired in this module</b>	<p>++ Neurosci. knowlg. ++ Expt. Methods + Independent research ++ Scient. Literature + Social skills + Maths/Stats/Progr. ++ Data present./disc. + Scientific English + Ethics</p> <p>Upon successful completion of this course, students</p> <ul style="list-style-type: none"> <li>• have basic knowledge of electrophysiological techniques used in neuroscience research</li> <li>• have acquired first practical skills in some electrophysiological techniques</li> <li>• have acquired basic skills in data analysis</li> <li>• have knowledge on retinal physiology and anatomy of the visual system</li> <li>• have basic knowledge of brain structures and their function</li> <li>• have profound knowledge of the architecture and circuits of the vertebrate retina</li> <li>• have acquired basic skills in histological techniques (tissue fixation, embedding, sectioning, staining procedures, immunohistochemistry)</li> <li>• have acquired fundamental skills in microscopy (differential interference contrast microscopy, phase-contrast microscopy, confocal microscopy)</li> </ul>
<b>Module contents</b>	<p>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.</p> <p>The seminars cover the following topics:</p> <ul style="list-style-type: none"> <li>• Visual system</li> <li>• Introduction to electrophysiological methods</li> <li>• Introduction into methods used in neuroanatomy and neurochemistry</li> <li>• Introduction into microscopy and image analysis</li> <li>• Presentation and discussion of results relating to the literature</li> </ul>
<b>Literatureempfehlungen</b>	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.

<b>Links</b>				
<b>Language of instruction</b>		English		
<b>Duration (semesters)</b>		1 Semester		
<b>Module frequency</b>		annually, summer term, first half (full time)		
<b>Module capacity</b>		12 - with Visual Neuroscience: Anatomy ( Shared course components with (cannot be credited twice): neu151 BM Visual Neuroscience: Anatomy )		
Examination		Prüfungszeiten	Type of examination	
<b>Final exam of module</b>		during the course (summer semester, first half) In addition, mandatory but ungraded: seminar presentation	PF	
Lehrveranstaltungsform	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		2	SoSe oder WiSe	28
Seminar		2	SoSe oder WiSe	28
Exercises		2	SoSe oder WiSe	28
<b>Präsenzzeit Modul insgesamt</b>				84 h



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## neu220 - Neurocognition and Psychopharmacology

Module label	Neurocognition and Psychopharmacology
Modulkürzel	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 )
Verwendbarkeit des Moduls	<ul style="list-style-type: none"><li>• Master's Programme Biology (Master) &gt; Background Modules</li><li>• Master's Programme Biology (Master) &gt; Background Modules</li><li>• Master's Programme Molecular Biomedicine (Master) &gt; Background Modules</li><li>• Master's Programme Neuroscience (Master) &gt; Background Modules</li></ul>
Zuständige Personen	<ul style="list-style-type: none"><li>• Thiel, Christiane Margarete (module responsibility)</li><li>• Thiel, Christiane Margarete (Module counselling)</li><li>• Thiel, Christiane Margarete (Prüfungsberechtigt)</li><li>• Gießing, Carsten (Prüfungsberechtigt)</li></ul>
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>
Literatureempfehlungen	Ward J (2010) The Student's Guide to Cognitive Neuroscience. Psychology

		Press Meyer JS and Quenzer LF (2012) Psychopharmacology. Sinauer		
<b>Links</b>				
<b>Language of instruction</b>		English		
<b>Duration (semesters)</b>		1 Semester		
<b>Module frequency</b>		jährlich		
<b>Module capacity</b>		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") )		
<b>Reference text</b>		Course in the second half of the semester Regular active participation is required to pass the module.		
Examination		Prüfungszeiten	Type of examination	
<b>Final exam of module</b>		as agreed, usually in the break after the winter term	100% written exam (content of the lectures)	
Lehrveranstaltungsform	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		3	--	42
Exercises		1	--	14
<b>Präsenzzeit Modul insgesamt</b>				56 h

## gsw230 - Molecular Pharmacology

<b>Module label</b>	Molecular Pharmacology			
<b>Modulkürzel</b>	gsw230			
<b>Credit points</b>	6.0 KP			
<b>Workload</b>	180 h			
<b>Verwendbarkeit des Moduls</b>	<ul style="list-style-type: none"> <li>• Master's Programme Molecular Biomedicine (Master) &gt; Background Modules</li> </ul>			
<b>Zuständige Personen</b>	<ul style="list-style-type: none"> <li>• Rauch, Bernhard (module responsibility)</li> <li>• Rauch, Bernhard (Prüfungsberechtigt)</li> <li>• Meyer, Ulrike (Module counselling)</li> </ul>			
<b>Prerequisites</b>	Enrolment in Master's programme Molecular Biomedicine			
<b>Skills to be acquired in this module</b>	<p><b>Goals of the module:</b> upon completion of this module, students</p> <ul style="list-style-type: none"> <li>- know about the subject of pharmacology in general, its areas of expertise such as pharmacokinetics and pharmacodynamics and their functions.</li> <li>- understand on which pathophysiological mechanisms diseases are based and on which molecular targets pharmaceuticals act in order to alleviate diseases.</li> <li>- know the basic actions and side effects of important drug groups.</li> <li>- understand basic parameters of clinical studies and the importance of clinical studies for therapeutic approaches.</li> </ul> <p><b>Skills to be acquired/ competencies:</b> ++ 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>			
<b>Module contents</b>	<ul style="list-style-type: none"> <li>• Fundamentals of general pharmacology, its specialist areas such as pharmacokinetics and pharmacodynamics</li> <li>• Explanation of the pathophysiological mechanisms of diseases and the corresponding molecular drugs targets</li> <li>• 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</li> </ul>			
<b>Literatureempfehlungen</b>	<p>Basic &amp; Clinical Pharmacology (Basic and Clinical Pharmacology), McGraw-Hill Education (2020) For German speaking students: Kurzlehrbuch Pharmakologie und Toxikologie, Herdegen, Thieme (2019)</p>			
<b>Links</b>				
<b>Language of instruction</b>	English			
<b>Duration (semesters)</b>	2 Semester			
<b>Module frequency</b>	winter term			
<b>Module capacity</b>	6 (Places are based on attended courses and given grades. Knowledge of physiology and biochemistry is required.)			
<b>Examination</b>	<b>Prüfungszeiten</b>		<b>Type of examination</b>	
<b>Final exam of module</b>	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)	
<b>Lehrveranstaltungsform</b>	<b>Comment</b>	<b>SWS</b>	<b>Frequency</b>	<b>Workload of compulsory attendance</b>
Vorlesung und Seminar		2	WiSe	28
Exercises		2	SoSe	28
<b>Präsenzzeit Modul insgesamt</b>				56 h

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## gsw240 - Basic Immunology in Health and Disease

Module label	Basic Immunology in Health and Disease
Modulkürzel	gsw240
Credit points	6.0 KP
Workload	180 h
Verwendbarkeit des Moduls	<ul style="list-style-type: none"><li>• Master's Programme Molecular Biomedicine (Master) &gt; Background Modules</li></ul>
Zuständige Personen	<ul style="list-style-type: none"><li>• Loser, Karin (module responsibility)</li><li>• Loser, Karin (Prüfungsberechtigt)</li><li>• Mykicki, Nadine (Prüfungsberechtigt)</li></ul>
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><b>Goals of this module:</b> 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><b>Skills to be acquired/ competencies:</b> ++ 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><b>Methods:</b> 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><b>Lecture:</b> - 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><b>Seminar:</b> - Presentation and discussion of laboratory methods used in the practical part</p> <p><b>Exercise:</b> 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>
Literatureempfehlungen	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

<b>Duration (semesters)</b>	1 Semester	
<b>Module frequency</b>	winter term	
<b>Module capacity</b>	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. )	
<b>Reference text</b>	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
<b>Final exam of module</b>	After the end of the module.	50% presentation, 50% protocol
<b>Lehrveranstaltungsform</b>	Seminar und Übung	
<b>SWS</b>	4	
<b>Frequency</b>	WiSe	
<b>Workload Präsenzzeit</b>	56 h	

## gsw250 - Molecular Microbiology

<b>Module label</b>	Molecular Microbiology			
<b>Modulkürzel</b>	gsw250			
<b>Credit points</b>	6.0 KP			
<b>Workload</b>	180 h			
<b>Verwendbarkeit des Moduls</b>	<ul style="list-style-type: none"> <li>Master's Programme Molecular Biomedicine (Master) &gt; Background Modules</li> </ul>			
<b>Zuständige Personen</b>	<ul style="list-style-type: none"> <li>Noster, Janina (module responsibility)</li> <li>Noster, Janina (Prüfungsberechtigt)</li> </ul>			
<b>Prerequisites</b>	Enrolment in Master's programme Molecular Biomedicine			
<b>Skills to be acquired in this module</b>	<p><b>Goals of this module:</b> Upon completion of this module the students will have a basic knowledge about bacteriology, antibiotic resistances and gene mutagenesis methods.</p> <p><b>Skills to be acquired/ competencies:</b>            ++ 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>			
<b>Module contents</b>	<p><b>Lecture:</b> 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><b>Seminar:</b> 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><b>Practical course:</b> 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>			
<b>Literatureempfehlungen</b>	Textbooks of microbiology. Current literature on antibiotic resistances and horizontal gene transfer will be announced in the lecture.			
<b>Links</b>				
<b>Language of instruction</b>	English			
<b>Duration (semesters)</b>	1 Semester			
<b>Module frequency</b>	winter term			
<b>Module capacity</b>	6 ( (participation at lectures is not restricted) )			
<b>Reference text</b>	The lecture is held weekly during the semester (first half). Seminar and practical course form a joint block course.			
<b>Examination</b>	<b>Prüfungszeiten</b>		<b>Type of examination</b>	
<b>Final exam of module</b>	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	
<b>Lehrveranstaltungsform</b>	<b>Comment</b>	<b>SWS</b>	<b>Frequency</b>	<b>Workload of compulsory attendance</b>
Lecture		1	WiSe	14
Seminar und Übung		3	WiSe	42
<b>Präsenzzeit Modul insgesamt</b>				56 h

## gsw260 - Molecular Virology

Module label		Molecular Virology		
Modulkürzel		gsw260		
Credit points		6.0 KP		
Workload		180 h		
Verwendbarkeit des Moduls		<ul style="list-style-type: none"><li>• Master's Programme Molecular Biomedicine (Master) &gt; Background Modules</li></ul>		
Zuständige Personen		<ul style="list-style-type: none"><li>• Kinast, Volker (module responsibility)</li><li>• Kinast, Volker (Prüfungsberechtigt)</li></ul>		
Prerequisites				
Skills to be acquired in this module		<p><b>Goals of this module:</b> upon completion of this module, students</p> <ul style="list-style-type: none"><li>- 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</li><li>- know safety aspects of working in a S2 laboratory and working with infectious agents</li><li>- are able to understand, explain and evaluate fundamental concepts and research results in the field of virology</li></ul> <p><b>Skills to be acquired/ competencies:</b> ++ comprehensive understanding of the fundamentals of virology ++ knowledge of virological working methods<ul style="list-style-type: none"><li>+ data analysis skills</li></ul>++ critical and analytical thinking<ul style="list-style-type: none"><li>+ independent searching and knowledge of scientific literature</li></ul>++ data presentation and discussion (written and spoken)<ul style="list-style-type: none"><li>+ teamwork</li><li>+ ethics and professional behavior</li></ul></p>		
Module contents		<p><b>Lecture:</b> Fundamentals of virology</p> <p><b>Seminar:</b> Discussion of selected aspects and methods of virology based on original/current literature</p> <p><b>Exercises:</b> cell culture, viral replication assays, luminescence assays, microscopy, data analysis and interpretation</p>		
Literatureempfehlungen		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)		
Lehrveranstaltungsform	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		1	SoSe	14
Seminar und Übung		3	SoSe	42
Präsenzzeit Modul insgesamt				56 h

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## bio845 - Introduction to Development and Evolution

Module label	Introduction to Development and Evolution
Modulkürzel	bio845
Credit points	6.0 KP
Workload	180 h
Verwendbarkeit des Moduls	<ul style="list-style-type: none"><li>• Master's Programme Biology (Master) &gt; Background Modules</li><li>• Master's Programme Biology (Master) &gt; Background Modules</li><li>• Master's Programme Molecular Biomedicine (Master) &gt; Background Modules</li><li>• Master's Programme Neuroscience (Master) &gt; Background Modules</li></ul>
Zuständige Personen	<ul style="list-style-type: none"><li>• Sienknecht, Ulrike (module responsibility)</li><li>• Sienknecht, Ulrike (Module counselling)</li><li>• Sienknecht, Ulrike (Prüfungsberechtigt)</li><li>• Claußen, Maike (Prüfungsberechtigt)</li></ul>
Prerequisites	

Skills to be acquired in this module	<p>Upon successful completion of this course, students</p> <ul style="list-style-type: none"><li>• know the fundamental problems organisms share in development</li><li>• know the common basic steps of ontogenesis after comparing the life cycles of different species (both vertebrates and invertebrates)</li><li>• know the fundamentals of the genetic control of cell-fate specification, morphogenesis, and organogenesis</li><li>• know the principles of gene regulatory networks in development and are able to explain examples</li><li>• are able to explain and discuss mechanisms of development across taxonomic groups and questions about the evolution of developmental mechanisms</li><li>• have in-depth knowledge of the development of animal nervous systems, including cellular and net-work properties</li></ul> <p>skills:</p> <ul style="list-style-type: none"><li>++ deepened biological expertise</li><li>+ deepened knowledge of biological working methods</li><li>++ interdisciplinary thinking</li><li>++ critical and analytical thinking</li><li>+ independent searching and knowledge of scientific literature</li><li>+ ability to perform independent biological research</li><li>+ teamwork</li></ul>
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Module contents	<p>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:</p> <ul style="list-style-type: none"><li>• Introduction to Developmental Biology</li><li>• Cell-Cell Communication</li><li>• Differential Gene Expression (I and II)</li><li>• Early Development of Vertebrates, Gastrulation</li><li>• Neurulation</li><li>• Brain Development</li><li>• Axonal Growth, Target Selection, Synaptogenesis and Refinement</li><li>• Neural Crest</li><li>• Mesoderm Development</li><li>• Morphogenesis</li><li>• Developmental Mechanisms of Evolutionary Change</li><li>• Model Organisms in Developmental Biology</li><li>• Transgenic Mice</li><li>• Medical Implications of Developmental Biology</li></ul>
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## Literaturempfehlungen

**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)		
Type of module		Wahlpflicht / Elective		
Module level		MM (Mastermodul / Master module)		
Teaching/Learning method		Lecture, seminar		
Previous knowledge		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)
Lehrveranstaltungsform	Comment	SWS		Frequency      Workload of compulsory attendance
Lecture		3		WiSe      45
Seminar		3		WiSe      45
Präsenzzeit Modul insgesamt				
90 h				

## gsw231 - Molecular Pharmacology and Toxicology

Module label	Molecular Pharmacology and Toxicology		
Modulkürzel	gsw231		
Credit points	6.0 KP		
Workload	180 h		
Verwendbarkeit des Moduls	<ul style="list-style-type: none"><li>• Master's Programme Molecular Biomedicine (Master) &gt; Background Modules</li></ul>		
Zuständige Personen	<ul style="list-style-type: none"><li>• Rauch, Bernhard (module responsibility)</li><li>• Rauch, Bernhard (Prüfungsberechtigt)</li><li>• Meyer, Ulrike (Module counselling)</li></ul>		
Prerequisites	Enrolment in the Master´s programme „Molecular Biomedicie“ Enrolment in the Bachelors´s programme „Chemie“		
Skills to be acquired in this module	<p>Upon completion of this module, students</p> <ul style="list-style-type: none"><li>- know about the subject of pharmacology in general, its areas of expertise such as pharmacokinetics and pharmacodynamics and their functions.</li><li>- understand on which pathophysiological mechanisms diseases are based and on which molecular targets pharmaceuticals act in order to alleviate diseases.</li><li>- know the basic actions and side effects of important drug groups.</li><li>- understand basic parameters of clinical studies and the importance of clinical studies for therapeutic approaches.</li></ul> <p>Skills to be acquired/ competencies:</p> <ul style="list-style-type: none"><li>++ deepened biological expertise</li><li>++ deepened clinical expertise</li><li>+ interdisciplinary thinking</li><li>+ critical and analytical thinking</li><li>+ independent searching and knowledge of scientific literature</li><li>+ data presentation and discussion (written and spoken)</li><li>+ ethics and professional behavior</li><li>+ basic knowledge of physiology and biochemistry is required</li></ul>		
Module contents	<ul style="list-style-type: none"><li>• Fundamentals of general pharmacology, its specialist areas such as pharmacokinetics and pharmacodynamics</li><li>• Explanation of the pathophysiological mechanisms of diseases and the corresponding molecular drugs targets</li><li>• Mechanisms of action and side effects of the major drug groups Mechanisms of action and toxins</li><li>• Mechanisms of action of common toxins and antidotes</li><li>• Knowledge of basic parameters of clinical studies and understanding of the importance of clinical studies for therapeutic approaches</li></ul>		
Literatureempfehlungen	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	Klausur oder mündl. Prüfung		
Lehrveranstaltungsform	Lecture		
SWS	4		
Frequency	SoSe oder WiSe		
Workload Präsenzzeit	56 h 4 SWS		

## gsw235 - Practical Molecular Pharmacology

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

## gsw270 - Introduction to Human Anatomy

Module label	Introduction to Human Anatomy			
Modulkürzel	gsw270			
Credit points	3.0 KP			
Workload	90 h ( 2 SWS )			
Verwendbarkeit des Moduls	<ul style="list-style-type: none"><li>• Master's Programme Molecular Biomedicine (Master) &gt; Background Modules</li></ul>			
Zuständige Personen	<ul style="list-style-type: none"><li>• Maier, Esther Christine (module responsibility)</li><li>• Maier, Esther Christine (Prüfungsberechtigt)</li></ul>			
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	Description +++ Anatomical knowledge ++ Social skills + Interdisciplinary knowledge + Data present./disc. ++ Scientific English ++ Ethics 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.			
Literatureempfehlungen				
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	
Lehrveranstaltungsform	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		1	SoSe oder WiSe	0
Seminar		1	SoSe oder WiSe	0
Präsenzzeit Modul insgesamt				0 h

# Clinical Modules

## gsw060 - Epigenetics and Gene Regulation

Module label	Epigenetics and Gene Regulation
Modulkürzel	gsw060
Credit points	6.0 KP
Workload	180 h
Verwendbarkeit des Moduls	<ul style="list-style-type: none"> <li>Master's Programme Molecular Biomedicine (Master) &gt; Clinical Modules</li> </ul>
Zuständige Personen	<ul style="list-style-type: none"> <li>Plösch, Torsten (module responsibility)</li> <li>Heep, Axel (module responsibility)</li> <li>Plösch, Torsten (Prüfungsberechtigt)</li> <li>Heep, Axel (Prüfungsberechtigt)</li> <li>Hinz, Cornelia (Prüfungsberechtigt)</li> </ul>
Prerequisites	Enrolment in Master's programme Molecular Biomedicine
Skills to be acquired in this module	<p><b>Goals of the Module:</b> Upon successful completion of this module, students</p> <ul style="list-style-type: none"> <li>- know about epigenetic regulation of gene transcription</li> <li>- can determine different epigenetic features</li> <li>- have a basic understanding of the role of epigenetics in human disease</li> </ul> <p><b>Competencies:</b> ++ 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</p>
Module contents	<p><b>Lecture:</b></p> <ul style="list-style-type: none"> <li>- introduction to epigenetics</li> <li>- regulation of gene expression</li> <li>- developmental epigenetics</li> <li>- cancer epigenetics</li> <li>- current methods</li> <li>- ethics</li> </ul> <p><b>Seminar:</b></p> <ul style="list-style-type: none"> <li>- presentation of important historical and current primary literature</li> <li>- presentation and discussion of lab methods used in the practical part</li> </ul> <p><b>Exercise:</b></p> <ul style="list-style-type: none"> <li>- Designing bisulfite PCR strategies for methylated DNA</li> <li>- analyses of datasets</li> <li>- DNA isolation from cells</li> <li>- <i>in vitro</i> methylation of DNA</li> <li>- methylation-specific restriction analysis (and PCR)</li> <li>- methylation-specific bisulfite PCR</li> <li>- histone characterization</li> </ul>
Literaturempfehlungen	
Links	<a href="https://uol.de/en/paediatrics/perinatal-neurobiology">https://uol.de/en/paediatrics/perinatal-neurobiology</a>
Language of instruction	English
Duration (semesters)	1 Semester
Module frequency	summer 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	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%

Lehrveranstaltungsform	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		1	SoSe	14
Seminar		1	SoSe	14
Exercises		2	SoSe	28
<b>Präsenzzeit Modul insgesamt</b>				<b>56 h</b>

## gsw070 - Gene-based Therapies in Human diseases

Module label	Gene-based Therapies in Human diseases			
Modulkürzel	gsw070			
Credit points	6.0 KP			
Workload	180 h			
Verwendbarkeit des Moduls	<ul style="list-style-type: none"><li>• Master's Programme Molecular Biomedicine (Master) &gt; Clinical Modules</li></ul>			
Zuständige Personen	<ul style="list-style-type: none"><li>• Neidhardt, John (module responsibility)</li><li>• Neidhardt, John (Prüfungsberechtigt)</li><li>• Jüschke, Christoph (Prüfungsberechtigt)</li></ul>			
Prerequisites	Enrolment in Master´s programme Molecular Biomedicine			
Skills to be acquired in this module	<p><b>Competencies:</b></p> <p>++ deepened biological expertise</p> <p>++ deepened clinical expertise</p> <p>++ deepened knowledge of biological working methods</p> <p>+ deepened knowledge of clinical diagnostics</p> <p>+ data analysis skills</p> <p>+ interdisciplinary thinking</p> <p>++ critical and analytical thinking</p> <p>+ independent searching and knowledge of scientific literature</p> <p>++ ability to perform independent biological research</p> <p>+ data presentation and discussion (written and spoken)</p> <p>+ team work</p> <p>+ project and time management</p> <p>Adressing 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>			
Literatureempfehlungen	Molecular Biology of the Cell (Alberts et al., 6th edition)			
Links	<a href="https://uol.de/humangenetik/research-and-clinical-collaborations/">https://uol.de/humangenetik/research-and-clinical-collaborations/</a>			
Language of instruction	English			
Duration (semesters)	1 Semester			
Module frequency	summer semester			
Module capacity	15			
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			
Lehrveranstaltungsform	Comment	SWS	Frequency	Workload of compulsory attendance

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Lehrveranstaltungsform	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		1	SoSe	14
Exercises		3	SoSe	42
<b>Präsenzzeit Modul insgesamt</b>				<b>56 h</b>



## gsw080 - Genetic Diagnostics: from chromosomal aberrations to gene mutations

Module label	Genetic Diagnostics: from chromosomal aberrations to gene mutations			
Modulkürzel	gsw080			
Credit points	6.0 KP			
Workload	180 h			
Verwendbarkeit des Moduls	<ul style="list-style-type: none"><li>• Master's Programme Molecular Biomedicine (Master) &gt; Clinical Modules</li></ul>			
Zuständige Personen	<ul style="list-style-type: none"><li>• Owczarek-Lipska, Marta (module responsibility)</li><li>• Owczarek-Lipska, Marta (Prüfungsberechtigt)</li></ul>			
Prerequisites	Enrolment in Master´s programme Molecular Biomedicine			
Skills to be acquired in this module	<p><b>Goals of the Module:</b> 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><b>Competencies:</b> ++ 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><b>Lecture:</b> essentials of classical cytogenetics and molecular genetics, classification of mutations, genetics syndromes/diseases, introduction to the genetic diagnostic laboratory techniques</p> <p><b>Exercises:</b> chromosomal stainings, microscopy, karyotyping, identification of chromosomal aberrations, identification of gene mutations</p>			
Literaturempfehlungen	Principles of Clinical Cytogenetics by Steven L. Gersen, Martha B. Keagle			
Links	<a href="https://uol.de/genetik-gehirnfehlbildungen/forschungsschwerpunkte/">https://uol.de/genetik-gehirnfehlbildungen/forschungsschwerpunkte/</a>			
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, 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 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%) additionally ungraded: signed lab protocols	
Lehrveranstaltungsform	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		1	WiSe	14
Seminar		1	WiSe	14

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Lehrveranstaltungsform	Comment	SWS	Frequency	Workload of compulsory attendance
Exercises		2	WiSe	28
<b>Präsenzzeit Modul insgesamt</b>				<b>56 h</b>

## gsw090 - Current Topics in Clinical Research

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

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

## gsw100 - Immunology and Inflammation

<b>Module label</b>	Immunology and Inflammation		
<b>Modulkürzel</b>	gsw100		
<b>Credit points</b>	6.0 KP		
<b>Workload</b>	180 h		
<b>Verwendbarkeit des Moduls</b>	<ul style="list-style-type: none"> <li>Master's Programme Molecular Biomedicine (Master) &gt; Clinical Modules</li> </ul>		
<b>Zuständige Personen</b>	<ul style="list-style-type: none"> <li>Loser, Karin (module responsibility)</li> <li>Loser, Karin (Prüfungsberechtigt)</li> </ul>		
<b>Prerequisites</b>	Enrolment in Master's programme Molecular Biomedicine		
<b>Skills to be acquired in this module</b>	<b>Competencies:</b> ++ comprehensive understanding of the fundamentals of immunology and inflammation ++ deepened knowledge of clinical aspects of diseases ++ systematic understanding in the therapy diseases + interdisciplinary thinking + critical and analytical thinking ++ independent searching and knowledge of scientific literature ++ data presentation and discussion (written and spoken) ++ teamwork + time management		
<b>Module contents</b>	The module focuses on dermatology, immunology and inflammation.  <b>Lectures:</b> Fundamentals of immunology and inflammation  <b>Seminars:</b> Worked examples of major inflammatory diseases (e.g. allergies, infections, autoimmune diseases) and advanced therapeutic concepts.  <b>Exercises:</b> 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)		
<b>Literatureempfehlungen</b>	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		
<b>Links</b>	<a href="https://uol.de/dermatologie/forschung/">https://uol.de/dermatologie/forschung/</a>		
<b>Language of instruction</b>	English		
<b>Duration (semesters)</b>	1 Semester		
<b>Module frequency</b>	First half of the winter semester		
<b>Module capacity</b>	25		
<b>Type of module</b>	Wahlpflicht / Elective		
<b>Module level</b>	MM (Mastermodul / Master module)		
<b>Teaching/Learning method</b>	Lecture, Seminar, Exercise		
<b>Previous knowledge</b>	basis knowledge in immunology		
<b>Examination</b>	<b>Prüfungszeiten</b>	<b>Type of examination</b>	
<b>Final exam of module</b>		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	
<b>Lehrveranstaltungsform</b>	<b>Comment</b>	<b>SWS</b>	<b>Frequency</b>
Lecture		1.5	WiSe
Seminar		1	WiSe
Exercises		1.5	WiSe
			<b>Workload of compulsory attendance</b>
			21
			14
			21

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Lehrveranstaltungsform	Comment	SWS	Frequency	Workload of compulsory attendance
<b>Präsenzzeit Modul insgesamt</b>				56 h

## gsw110 - Clinical Aspects of Degenerative Diseases

Module label	Clinical Aspects of Degenerative Diseases			
Modulkürzel	gsw110			
Credit points	6.0 KP			
Workload	180 h			
Verwendbarkeit des Moduls	<ul style="list-style-type: none"><li>• Master's Programme Molecular Biomedicine (Master) &gt; Clinical Modules</li></ul>			
Zuständige Personen	<ul style="list-style-type: none"><li>• Zieschang, Tania (module responsibility)</li><li>• Dewald, Oliver (module responsibility)</li><li>• Zieschang, Tania (Prüfungsberechtigt)</li><li>• Koschate, Jessica (Prüfungsberechtigt)</li><li>• Mellert, Friedrich (Prüfungsberechtigt)</li><li>• Ort, Katharina (Prüfungsberechtigt)</li><li>• Hoppe, Florian (Prüfungsberechtigt)</li></ul>			
Prerequisites	Enrolment in Master´s programme Molecular Biomedicine			
Skills to be acquired in this module	<b>Competencies:</b> ++ comprehensive understanding of clinical manifestation, epidemiology, risk factors, treatment strategies of degenerative diseases ++ understanding of geriatric phenomena ++ understanding and application of the comprehensive geriatric assessment (CGA) ++ interdisciplinary thinking ++ ethics and professional behaviour ++ critical and analytical thinking + independent searching and knowledge of scientific literature ++ data presentation and discussion (written and spoken) ++ teamwork			
Module contents	<p>The module focuses on geriatric medicine.</p> <p><b>Lecture:</b> 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><b>Seminar:</b> instant ageing, the geriatric team, cognitive assessment with actors, work in heart team</p> <p><b>Excursion:</b> 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>			
Literatureempfehlungen	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	<a href="https://www.aortenklappenregister.de/publikationen-des-registers.html">https://www.aortenklappenregister.de/publikationen-des-registers.html</a>			
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%)		
Lehrveranstaltungsform	Comment	SWS	Frequency	Workload of compulsory attendance

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Lehrveranstaltungsform	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		1.5	WiSe	28
Seminar		1.5	WiSe	21
Exercises		1	WiSe	14
<b>Präsenzzeit Modul insgesamt</b>				<b>63 h</b>



## gsw120 - Tumor Biology

Module label	Tumor Biology
Modulkürzel	gsw120
Credit points	6.0 KP
Workload	180 h
Verwendbarkeit des Moduls	<ul style="list-style-type: none"> <li>Master's Programme Molecular Biomedicine (Master) &gt; Clinical Modules</li> </ul>
Zuständige Personen	<ul style="list-style-type: none"> <li>Griesinger, Frank (module responsibility)</li> <li>Griesinger, Frank (Prüfungsberechtigt)</li> <li>Roeper, Julia (Prüfungsberechtigt)</li> <li>Dübbel, Lena (Prüfungsberechtigt)</li> <li>Loser, Karin (Prüfungsberechtigt)</li> <li>Mykicki, Nadine (Prüfungsberechtigt)</li> <li>Dübbel, Lena (Module counselling)</li> <li>Roeper, Julia (Module counselling)</li> </ul>
Prerequisites	Enrolment in Master's programme Molecular Biomedicine
Skills to be acquired in this module	<p><b>Goals of the Module:</b> Upon successful completion of this module, students</p> <ul style="list-style-type: none"> <li>- can define and identify oncogenes and tumor suppressor genes</li> <li>- know about the hallmarks of cancer and can explain them based on example pathways and traits</li> <li>- know about the complexity of the tumor tissue and the different cells that are involved</li> <li>- know about the principles of metastasis.</li> </ul> <p><b>Competencies:</b> ++ deepened biological &amp; clinical expertise ++ interdisciplinary thinking + deepened knowledge of biological working methods &amp; clinical diagnostics ++ data analysis skills + usage of databases and computational tools ++ critical &amp; analytical thinking + independent searching &amp; knowledge of scientific literature ++ data presentation &amp; discussion (written and spoken) + teamwork ++ ethics &amp; professional behavior</p>
Module contents	<p><b>Part 1 - Lecture:</b> 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><b>Part 2 - Seminar:</b> 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><b>Optional:</b> 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>
Literaturempfehlungen	<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	winter and summer semester (seminars during the semester break)
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%)		
Lehrveranstaltungsform	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		2	SoSe und WiSe	28
Seminar		2	SoSe und WiSe	28
Präsenzzeit Modul insgesamt				56 h

## gsw130 - Regenerative Medicine in Ophthalmology

Module label	Regenerative Medicine in Ophthalmology			
Modulkürzel	gsw130			
Credit points	6.0 KP			
Workload	180 h			
Verwendbarkeit des Moduls	<ul style="list-style-type: none"><li>• Master's Programme Molecular Biomedicine (Master) &gt; Clinical Modules</li></ul>			
Zuständige Personen	<ul style="list-style-type: none"><li>• Mertsch, Sonja (module responsibility)</li><li>• Mertsch, Sonja (Prüfungsberechtigt)</li><li>• Schrader, Stefan (Prüfungsberechtigt)</li></ul>			
Prerequisites	Enrolment in Master´s programme Molecular Biomedicine			
Skills to be acquired in this module	<b>Competencies:</b> ++ 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 <ul style="list-style-type: none"><li>+ interdisciplinary thinking</li><li>+ critical and analytical thinking</li></ul> ++ data analysis and interpretation skills ++ data presentation and discussion (written and spoken) ++ teamwork			
Module contents	<p>The module focuses on regenerative medicine in ophthalmology.</p> <p><b>Lectures:</b> Fundamentals of ophthalmologic diseases and insights of current ophthalmologic research projects including tissue engineering methods</p> <p><b>Exercises:</b> 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>			
Literatureempfehlungen	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	<a href="https://uol.de/augenheilkunde">https://uol.de/augenheilkunde</a>			
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%)			
Lehrveranstaltungsform	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		1	WiSe	14
Exercises		3	WiSe	42
Präsenzzeit Modul insgesamt				56 h

## Research Modules

### gsw150 - Research Project Molecular Biomedicine

Module label	Research Project Molecular Biomedicine	
Modulkürzel	gsw150	
Credit points	15.0 KP	
Workload	450 h	
Verwendbarkeit des Moduls	<ul style="list-style-type: none"> <li>Master's Programme Molecular Biomedicine (Master) &gt; Research Modules</li> </ul>	
Zuständige Personen	<ul style="list-style-type: none"> <li>Koch, Karl-Wilhelm (module responsibility)</li> <li>Koch, Karl-Wilhelm (Prüfungsberechtigt)</li> </ul>	
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	<b>Competencies:</b> ++ 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	<b>Emphasis on research</b>  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)  There are several options for the lab projects, for example in the broad categories of: <a href="https://uol.de/en/neurosciences/">https://uol.de/en/neurosciences/</a> <a href="https://uol.de/en/biochemistry/research/">https://uol.de/en/biochemistry/research/</a> <a href="https://uol.de/en/neurogenetics/research/">https://uol.de/en/neurogenetics/research/</a> <a href="https://uol.de/en/retina/research/">https://uol.de/en/retina/research/</a> <a href="https://uol.de/humanmedizin/">https://uol.de/humanmedizin/</a> <a href="https://uol.de/anatomie/forschung/">https://uol.de/anatomie/forschung/</a> <a href="https://uol.de/dermatologie/forschung/">https://uol.de/dermatologie/forschung/</a> <a href="https://uol.de/immunologie/aktuelle-forschungsprojekte">https://uol.de/immunologie/aktuelle-forschungsprojekte</a> <a href="https://uol.de/humangenetik/research-and-clinical-collaborations/">https://uol.de/humangenetik/research-and-clinical-collaborations/</a> <a href="https://uol.de/genetik-gehirnfehlbildungen/forschungsschwerpunkte/">https://uol.de/genetik-gehirnfehlbildungen/forschungsschwerpunkte/</a> <a href="https://uol.de/augenheilkunde/forschungsschwerpunkte">https://uol.de/augenheilkunde/forschungsschwerpunkte</a>	
Literatureempfehlungen	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	

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Lehrveranstaltungsform	Comment	SWS	Frequency	Workload of compulsory attendance
Seminar		2	SoSe oder WiSe	28
Project (Individuelles Forschungsprojekt)		8	SoSe oder WiSe	112
<b>Präsenzzeit Modul insgesamt</b>				<b>140 h</b>

## gsw160 - External Research Project Molecular Biomedicine

<b>Module label</b>	External Research Project Molecular Biomedicine			
<b>Modulkürzel</b>	gsw160			
<b>Credit points</b>	15.0 KP			
<b>Workload</b>	450 h			
<b>Verwendbarkeit des Moduls</b>	<ul style="list-style-type: none"> <li>• Master's Programme Molecular Biomedicine (Master) &gt; Research Modules</li> </ul>			
<b>Zuständige Personen</b>	<ul style="list-style-type: none"> <li>• Koch, Karl-Wilhelm (module responsibility)</li> <li>• Koch, Karl-Wilhelm (Prüfungsberechtigt)</li> </ul>			
<b>Further responsible persons</b>	all teachers of the curriculum (module counselling, authorized examiners)			
<b>Prerequisites</b>	as defined in the admission and examination regulations			
<b>Skills to be acquired in this module</b>	<b>Competencies:</b> ++ 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			
<b>Module contents</b>	<b>Emphasis on research</b>  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).			
<b>Literatureempfehlungen</b>	Specific literature of the topics indicated above; original papers related to the current research question; will be different for every student and every year.			
<b>Links</b>				
<b>Language of instruction</b>	English			
<b>Duration (semesters)</b>	1 Semester			
<b>Module frequency</b>	every semester, time is flexible and subject to individual arrangement			
<b>Module capacity</b>	unlimited			
<b>Type of module</b>	Wahlpflicht / Elective			
<b>Module level</b>	MM (Mastermodul / Master module)			
<b>Teaching/Learning method</b>	Seminar and Project			
<b>Previous knowledge</b>	basic knowledge of cell biology, genetics, biochemistry or clinical biomedicine			
Examination	Prüfungszeiten		Type of examination	
<b>Final exam of module</b>			graded: project report ungraded: participation in seminar and 30 min. presentation	
Lehrveranstaltungsform	Comment	SWS	Frequency	Workload of compulsory attendance
Seminar		2	SoSe oder WiSe	28
Project (Individuelles Forschungsprojekt)		8	SoSe oder WiSe	112
<b>Präsenzzeit Modul insgesamt</b>				140 h

## Skills Modules

### gsw170 - Research Techniques Molecular Biomedicine

<b>Module label</b>	Research Techniques Molecular Biomedicine			
<b>Modulkürzel</b>	gsw170			
<b>Credit points</b>	6.0 KP			
<b>Workload</b>	180 h			
<b>Verwendbarkeit des Moduls</b>	<ul style="list-style-type: none"> <li>Master's Programme Molecular Biomedicine (Master) &gt; Skills Modules</li> </ul>			
<b>Zuständige Personen</b>	<ul style="list-style-type: none"> <li>Hartmann, Anna-Maria (module responsibility)</li> <li>Hartmann, Anna-Maria (Prüfungsberechtigt)</li> </ul>			
<b>Prerequisites</b>	Enrolment in Master's programme Molecular Biomedicine			
<b>Skills to be acquired in this module</b>	<p><b>Competencies:</b></p> <p>++ 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> <p>Basic knowledge of techniques used in molecular biomedicine</p>			
<b>Module contents</b>	<p>The module focuses on competence in research methods.</p> <p><b>Seminar:</b>            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><b>Exercise:</b>            molecular biological techniques (PCR, agarose gel, plasmid preparation, restriction), immunological methods (cell culturing, cytochemistry), biochemistry techniques (SDS gel, western blotting, protein purification, photometry)</p>			
<b>Literatureempfehlungen</b>	Bioanalytics: Analytical Methods and Concepts in Biochemistry and Molecular Biology, Lottspeich and Engels (ISBN-13: 978-3527339198.			
<b>Links</b>				
<b>Language of instruction</b>	English			
<b>Duration (semesters)</b>	1 Semester			
<b>Module frequency</b>	Second half of the winter semester; annually			
<b>Module capacity</b>	25			
<b>Type of module</b>	Wahlpflicht / Elective			
<b>Module level</b>	MM (Mastermodul / Master module)			
<b>Teaching/Learning method</b>	Seminar and Exercise			
Examination	Prüfungszeiten		Type of examination	
<b>Final exam of module</b>			graded; presentation (20 min.) ungraded: signed protocols	
Lehrveranstaltungsform	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		2	WiSe	28
Practical training		2	WiSe	28
<b>Präsenzzeit Modul insgesamt</b>				56 h

## gsw180 - Ethics in Medicine

Module label	Ethics in Medicine		
Modulkürzel	gsw180		
Credit points	3.0 KP		
Workload	90 h		
Verwendbarkeit des Moduls	<ul style="list-style-type: none"><li>Master's Programme Molecular Biomedicine (Master) &gt; Skills Modules</li></ul>		
Zuständige Personen	<ul style="list-style-type: none"><li>Schweda, Mark (module responsibility)</li><li>Schweda, Mark (Prüfungsberechtigt)</li><li>Weßel, Merle (Prüfungsberechtigt)</li></ul>		
Prerequisites	Enrolment in Master’s programme Molecular Biomedicine		
Skills to be acquired in this module	<b>Competencies:</b> ++ deepened medical / ethical expertise with a focus on research ethics ++ 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	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)		
Literatureempfehlungen	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		
Links	<a href="https://uol.de/medizinethik/">https://uol.de/medizinethik/</a>		
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		
Lehrveranstaltungsform	Vorlesung und Seminar		
SWS	2		
Frequency	WiSe		
Workload Präsenzzeit	28 h		



## gsw190 - Journal Club

<b>Module label</b>	Journal Club	
<b>Modulkürzel</b>	gsw190	
<b>Credit points</b>	3.0 KP	
<b>Workload</b>	90 h	
<b>Verwendbarkeit des Moduls</b>	<ul style="list-style-type: none"> <li>• Master's Programme Molecular Biomedicine (Master) &gt; Skills Modules</li> </ul>	
<b>Zuständige Personen</b>	<ul style="list-style-type: none"> <li>• Mertsch, Sonja (module responsibility)</li> <li>• Mertsch, Sonja (Prüfungsberechtigt)</li> <li>• Maier, Esther Christine (Prüfungsberechtigt)</li> <li>• Schrader, Stefan (Prüfungsberechtigt)</li> </ul>	
<b>Further responsible persons</b>	all teachers of the curriculum	
<b>Prerequisites</b>	Enrolment in Master's programme Molecular Biomedicine. Neuroscience and Biology students can participate on request.	
<b>Skills to be acquired in this module</b>	<b>Competencies:</b> ++ reading and understanding of original scientific literature ++ 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 + ability to perform independent biological research ++ data presentation and discussion (written and spoken)	
<b>Module contents</b>	The module focuses on current topics in molecular cell biology and biomedicine.  Seminar topics: original literature of molecular life science related to health and disease	
<b>Literatureempfehlungen</b>	publications related to the current research question	
<b>Links</b>		
<b>Language of instruction</b>	English	
<b>Duration (semesters)</b>	1 Semester	
<b>Module frequency</b>	winter and summer semester	
<b>Module capacity</b>	20	
<b>Type of module</b>	Wahlpflicht / Elective	
<b>Module level</b>	MM (Mastermodul / Master module)	
<b>Teaching/Learning method</b>	Seminar	
<b>Previous knowledge</b>	basic knowledge of cell biology, genetics, biochemistry	
Examination	Prüfungszeiten	Type of examination
<b>Final exam of module</b>		2 presentations
<b>Lehrveranstaltungsform</b>	Seminar	
<b>SWS</b>	2	
<b>Frequency</b>	SoSe und WiSe	
<b>Workload Präsenzzeit</b>	28 h	

## gsw200 - Microscopic Imaging in Biomedical Sciences

Module label	Microscopic Imaging in Biomedical Sciences		
Modulkürzel	gsw200		
Credit points	3.0 KP		
Workload	90 h		
Verwendbarkeit des Moduls	<ul style="list-style-type: none"><li>• Master's Programme Molecular Biomedicine (Master) &gt; Skills Modules</li><li>• Master's Programme Neuroscience (Master) &gt; Skills Modules</li></ul>		
Zuständige Personen	<ul style="list-style-type: none"><li>• Dedek, Karin (module responsibility)</li><li>• Groß, Petra (Prüfungsberechtigt)</li><li>• Dedek, Karin (Prüfungsberechtigt)</li><li>• Solovyeva, Vita (Prüfungsberechtigt)</li></ul>		
Prerequisites	Enrolment in Master´s programmes Molecular Biomedicine and Neuroscience.		
Skills to be acquired in this module	<b>Competencies:</b> + 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	<p>The module focuses on microscopy, imaging and methods of microscopy.</p> <p><b>Lecture:</b> Basics in optics, microscopy methods, image processing, biomedical applications</p> <p><b>Seminar:</b> 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.</p>		
Literatureempfehlungen	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

Lehrveranstaltungsform	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		1	WiSe	14
Seminar		1	WiSe	14
<b>Präsenzzeit Modul insgesamt</b>				<b>28 h</b>

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## neu751 - Laboratory Animal Science

Module label	Laboratory Animal Science
Modulkürzel	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 )
Verwendbarkeit des Moduls	<ul style="list-style-type: none"><li>• Master's Programme Biology (Master) &gt; Skills Modules</li><li>• Master's Programme Biology (Master) &gt; Skills Modules</li><li>• Master's Programme Molecular Biomedicine (Master) &gt; Skills Modules</li><li>• Master's Programme Neuroscience (Master) &gt; Skills Modules</li></ul>
Zuständige Personen	<ul style="list-style-type: none"><li>• Köppl, Christine (module responsibility)</li><li>• Köppl, Christine (Prüfungsberechtigt)</li><li>• Langemann, Ulrike (Prüfungsberechtigt)</li><li>• Nolte, Arne (Prüfungsberechtigt)</li><li>• Heyers, Dominik (Prüfungsberechtigt)</li><li>• Ebbers, Lena (Prüfungsberechtigt)</li><li>• Dedek, Karin (Prüfungsberechtigt)</li><li>• Schmaljohann, Heiko (Prüfungsberechtigt)</li><li>• Winklhofer, Michael (Prüfungsberechtigt)</li></ul>
Prerequisites	none
Skills to be acquired in this module	<p>++ Expt. Methods + Independent Research + Scient. Literature ++ Social skills ++ Interdiscipl. knowlg + Scientific English ++ Ethics</p> <p>Upon successful completion of this course, students</p> <ul style="list-style-type: none"><li>• know the relevant EU legislation governing animal welfare and are able to explain its meaning in common language</li><li>• understand and are able to critically discuss salient ethical concepts in animal experimentation, such as the three Rs and humane endpoint.</li><li>• have basic knowledge of the biology and husbandry of laboratory animal species held at the University of Oldenburg (rodents or birds or fish)</li><li>• are able to critically assess the needs and welfare of animals without compromising scientific integrity of the investigation</li><li>• have practical skills in handling small rodents or birds or fish</li><li>• have profound knowledge of anaesthesia, analgesia and basic principles of surgery.</li><li>• have practised invasive procedures and euthanasia.</li></ul> <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"><li>• Legislation, ethics and the 3Rs</li><li>• Scientific integrity</li><li>• Data collection "</li><li>• Basic biology of rodents, birds and fish</li><li>• Husbandry, and nutrition of rodents, birds and fish</li><li>• Animal Welfare</li><li>• Health monitoring</li><li>• Pain and distress</li><li>• Euthanasia</li></ul>

Practical procedures will first be demonstrated, important aspects will then be practiced under supervision by every participant, on an animal model of their choice (rodents, birds or fish):

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

Literatureempfehlungen		"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
Lehrveranstaltungsform	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		1	SoSe und WiSe	14
Exercises		1	SoSe und WiSe	14
Präsenzzeit Modul insgesamt				
28 h				

## neu760 - Scientific English

<b>Module label</b>	Scientific English	
<b>Modulkürzel</b>	neu760	
<b>Credit points</b>	6.0 KP	
<b>Workload</b>	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 )	
<b>Verwendbarkeit des Moduls</b>	<ul style="list-style-type: none"> <li>• Master's Programme Biology (Master) &gt; Skills Modules</li> <li>• Master's Programme Biology (Master) &gt; Skills Modules</li> <li>• Master's Programme Molecular Biomedicine (Master) &gt; Skills Modules</li> <li>• Master's Programme Neuroscience (Master) &gt; Skills Modules</li> </ul>	
<b>Zuständige Personen</b>	<ul style="list-style-type: none"> <li>• Köppl, Christine (module responsibility)</li> <li>• Köppl, Christine (Prüfungsberechtigt)</li> </ul>	
<b>Prerequisites</b>	non-native speakers	
<b>Skills to be acquired in this module</b>	+ Neurosci. knowlg. ++ Social skills ++ Data present./disc. ++ Scientific English  Upon completion of this course, students <ul style="list-style-type: none"> <li>• have increased their proficiency in different forms of scientific presentation and communication in English, with special emphasis on neuroscience</li> <li>• are able to express themselves with correct sentence structure and grammar, correct use of idioms and correct pronunciation</li> <li>• are proficient in different contexts of scientific communication (e.g., paper, poster and informal exchange by email or phone)</li> <li>• are able to recognize and avoid common errors of non-native speakers.</li> </ul>	
<b>Module contents</b>	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.	
<b>Literatureempfehlungen</b>	<a href="http://users.wpi.edu/~nab/sci_eng/ScientificEnglish.pdf">http://users.wpi.edu/~nab/sci_eng/ScientificEnglish.pdf</a>	
<b>Links</b>		
<b>Language of instruction</b>	English	
<b>Duration (semesters)</b>	1 Semester	
<b>Module frequency</b>	annually, semester break	
<b>Module capacity</b>	12	
<b>Reference text</b>	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.	
<b>Previous knowledge</b>	minimum English level B2 (C1 preferred) according to Common European Framework of Reference for Languages (CEFR) priority to non-native speakers, higher semester	
<b>Examination</b>	<b>Prüfungszeiten</b>	<b>Type of examination</b>
<b>Final exam of module</b>	within 2 months of completing the course	Portfolio: 70% several quick tests, texts, presentations, 30% term paper Bonus system for active participation

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Lehrveranstaltungsform	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		0.5	WiSe	7
Exercises		3.5	WiSe	49
<b>Präsenzzeit Modul insgesamt</b>				<b>56 h</b>

## gsw210 - Scientific Communication

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

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<b>Lehrveranstaltungsform</b>	Seminar und Übung
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<b>SWS</b>	4
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<b>Frequency</b>	SoSe oder WiSe
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<b>Workload Präsenzzeit</b>	56 h
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## gsw220 - Bioinformatics and Omics

<b>Module label</b>	Bioinformatics and Omics			
<b>Modulkürzel</b>	gsw220			
<b>Credit points</b>	6.0 KP			
<b>Workload</b>	180 h			
<b>Verwendbarkeit des Moduls</b>	<ul style="list-style-type: none"> <li>Master's Programme Molecular Biomedicine (Master) &gt; Skills Modules</li> </ul>			
<b>Zuständige Personen</b>	<ul style="list-style-type: none"> <li>Hitz, Marc-Phillip (module responsibility)</li> <li>Gieldon, Laura (Prüfungsberechtigt)</li> <li>Hitz, Marc-Phillip (Prüfungsberechtigt)</li> <li>Audain Martinez, Enrique (Prüfungsberechtigt)</li> </ul>			
<b>Prerequisites</b>	Enrolment in Master's programme Molecular Biomedicine			
<b>Skills to be acquired in this module</b>				
<b>Module contents</b>				
<b>Literatureempfehlungen</b>	literature will be provided during the lecture/seminar;  a list will be distributed on forehand			
<b>Links</b>				
<b>Languages of instruction</b>				
<b>Duration (semesters)</b>	1 Semester			
<b>Module frequency</b>				
<b>Module capacity</b>	25			
<b>Examination</b>	<b>Prüfungszeiten</b>	<b>Type of examination</b>		
<b>Final exam of module</b>	will be announced in class;  at the end of the course	Portfolio (exercises, active participation during discussions)		
<b>Lehrveranstaltungsform</b>	<b>Comment</b>	<b>SWS</b>	<b>Frequency</b>	<b>Workload of compulsory attendance</b>
Seminar und Übung		2	--	28
Lecture		2	--	28
<b>Präsenzzeit Modul insgesamt</b>				56 h

## gsw215 - Introduction to Academic Writing

Module label	Introduction to Academic Writing			
Modulkürzel	gsw215			
Credit points	3.0 KP			
Workload	90 h ( Seminar 1SWS Übung 1SWS )			
Verwendbarkeit des Moduls	<ul style="list-style-type: none"><li>Master's Programme Molecular Biomedicine (Master) &gt; Skills Modules</li></ul>			
Zuständige Personen	<ul style="list-style-type: none"><li>Helgers, Simeon (module responsibility)</li><li>Dömer, Patrick (Prüfungsberechtigt)</li><li>Helgers, Simeon (Prüfungsberechtigt)</li></ul>			
Prerequisites	Enrolment in Master´s programme Molecular Biomedicine			
Skills to be acquired in this module	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. 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			
Module contents	The module focuses on the basic principles of academic practice. In theoretical and practical parts, the students will - 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. The module will consist of lectures and practical parts consisting of lab work, data analysis and writing assignments.			
Literatureempfehlungen				
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	
Lehrveranstaltungsform	Comment	SWS	Frequency	Workload of compulsory attendance
Seminar		1	SoSe oder WiSe	0
Exercises		1	SoSe oder WiSe	0
Präsenzzeit Modul insgesamt				0 h

# Masterabschlussmodul

## mam - Master Thesis Module

Module label	Master Thesis Module	
Modulkürzel	mam	
Credit points	30.0 KP	
Workload	900 h ( attendance in the lab meetings: 28 hours (2 SWS); theses work: 872 hours )	
Verwendbarkeit des Moduls	<ul style="list-style-type: none"> <li>Master's Programme Molecular Biomedicine (Master) &gt; Masterabschlussmodul</li> </ul>	
Zuständige Personen		
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:  <a href="https://uol.de/en/neurosciences/">https://uol.de/en/neurosciences/</a>  o <a href="https://uol.de/en/biochemistry/research/">https://uol.de/en/biochemistry/research/</a> o <a href="https://uol.de/en/neurogenetics/research/">https://uol.de/en/neurogenetics/research/</a> o <a href="https://uol.de/en/retina/research/">https://uol.de/en/retina/research/</a>  <a href="https://uol.de/humanmedizin/">https://uol.de/humanmedizin/</a>  o <a href="https://uol.de/anatomie/forschung/">https://uol.de/anatomie/forschung/</a> o <a href="https://uol.de/dermatologie/forschung/">https://uol.de/dermatologie/forschung/</a> o <a href="https://uol.de/humangenetik/research-and-clinical-collaborations/">https://uol.de/humangenetik/research-and-clinical-collaborations/</a>  <a href="https://uol.de/genetik-gehirnfehlbildungen/forschungsschwerpunkte/">https://uol.de/genetik-gehirnfehlbildungen/forschungsschwerpunkte/</a>	
Literaturempfehlungen	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%)
Lehrveranstaltungsform	Colloquium	
SWS	2	

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**Frequency**

SoSe oder WiSe

**Workload Präsenzzeit**

28 h

