



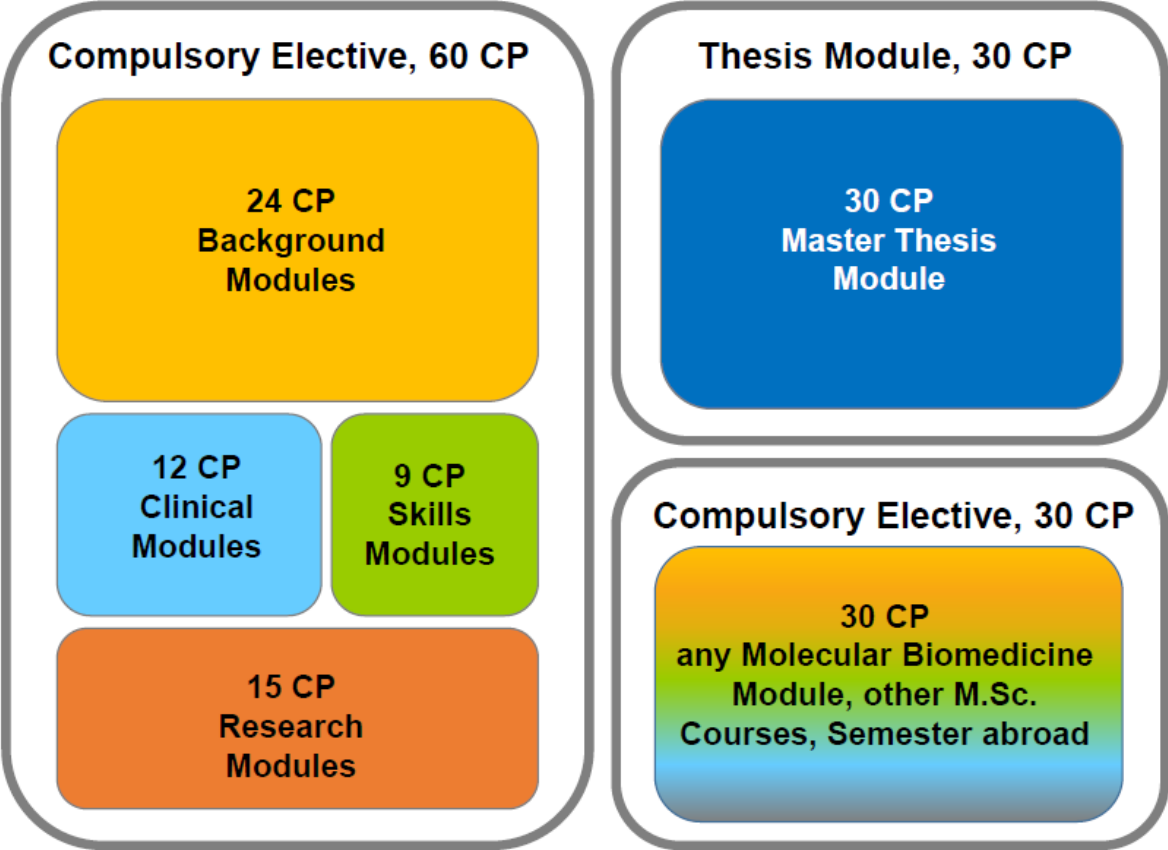
Handbook of Modules

Master of Science (M.Sc.)

Molecular Biomedicine

Faculty VI – Medicine and Health Sciences

Modules and Workload



Background Modules (9 Modules)

bio605 – Molecular Genetics and Cell Biology
bio695 – Biochemical Concepts in Signaltransduction
gsw010 – Molecular Physiology
gsw020 – Cellular and Subcellular Structures
gsw030 – Biophysical Chemistry
gsw040 – Molecular and Cellular Biology of Hearing and Deafness
gsw050– Current Topics in Genetics
neu150 – Visual Neuroscience: Anatomy
neu141 – Visual Neuroscience: Physiology and Anatomy

Clinical Modules (7 Modules)

gsw070 – Gene-based Therapies in Human Diseases
gsw080 – Genetic Diagnostics: from chromosomal aberrations to gene mutations
gsw090 – Current Topics in Clinical Research
gsw100 – Immunology and Inflammation
gsw110 – Clinical Aspects of Degenerative Diseases
gsw120 – Tumor Biology
gsw130 – Regenerative Medicine in Ophthalmology

Research Modules (2 Modules)

gsw150 – Research Project Molecular Biomedicine
gsw160 – External Research Project Molecular Biomedicine

Skills Modules (6 Modules)

gsw170 – Research Techniques Molecular Biomedicine
gsw180 – Ethics in Medicine
gsw190 – Journal Club
gsw200 – Microscopic Imaging in Biomedical Sciences
neu751 – Laboratory Animal Science
neu760 – Scientific English

Master Thesis Module (1 Module)

mam – Master Thesis Module

Module-Skills-Matrix

		deepened biological expertise	deepened clinical expertise	deepened knowledge of biological working methods	deepened knowledge of clinical diagnostics	data analysis skills	Compuergestützte Auswertungstechniken	interdisciplinary thinking	critical and analytical thinking	independent searching & knowledge of scientific literature	ability to perform independent research	data presentation and discussion	teamwork	ethics & professional behaviour	project and time management
	Module	knowledge				skills				competencies					
Background Modules	Molecular Genetics & Cell Biology	++		++		+		++	+	+		+	+	+	+
	Biochemical Concepts in Signaltransduction	++		++		++		+	++	+		++	+		+
	Molecular Physiology	++	++	++	++	+	+	+			+	+			
	Cellular and Subcellular Structures	++	++	++	++			+	+		+			+	
	Molecular Biophysics	++				+	+	+	++			++			
	Mol. & Cellular Biology of Hearing & Deafness	++		++		++		+	++	++		+	+		
	Current Topics in Genetics	++		++		+		+	++	++		++	+		
	Visual Neuroscience: Physiology & Anatomy	++		++		++		++	+		+	+	+		
	Visual Neuroscience: Anatomy	++		++	+	++		++	+		+	+	+		
Clinical Modules	Gene-based Therapies in Human Diseases	++	++	++	+	+		+	++	+	++	+	+		+
	Genetic Diagnostics	++	++	++	++	++		+	++	+	++	+	+		+
	Current Topics in Clinical Research		++	++	++	+		++	++	+				+	
	Immunology and Inflammation		++		++			+	+	++		++	++		+
	Clinical Aspects of Degenerative Diseases		++					++	++	+		++	++	++	
	Tumor Biology	+	+	+	+	++	+	++	++	+		++	+	++	+
	Regenerative Medicine in Ophthalmology	++	++	++	++	++		+	++			++	+		+
Skills Modules	Research Techniques Molecular Biomedicine			++	++	++		+	++		++	++			
	Ethics in Medicine		+					++	++	+		++	+	++	+
	Journal Club	++		+		++	+	+	+	++	+	++			
	Microscopic Imaging in Biomedical Sciences	+		++	+	+	+	++	++			++	+		
	Laboratory Animal Science	+		++		+		++		+	++		++	++	
	Scientific English							+		+		++	++		

 weak link

+ strong link

++ very strong link

Background Modules

bio605 – Molecular Genetics and Cell Biology

Module name	Molecular Genetics and Cell Biology
Module code	bio605
ECTS credit points	12.0 CP
Workload	360 h
Used in study program	M.Sc. Biology, M.Sc. Molecular Biomedicine
Contact persons	Module Responsibility: <ul style="list-style-type: none"> ○ Prof. Dr. John Neidhardt Additional teachers: <ul style="list-style-type: none"> ○ Prof. Dr. Karl Koch
Emphasis on	Molecular biology, molecular genetics, biochemistry, cell biology, neurobiology
Skills to be acquired in this module	++ 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), + teamwork, + ethics and professional behaviour, + project and time management
Module content	Addressing students with an emphasis on molecular biology, molecular genetics, cell biology and neurobiology 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. Exercise: Learning current methods of molecular biology and human genetics; high throughput technologies, introduction to cell cultivation techniques.
Prerequisites	B.Sc. (Biology, Biochemistry), as defined in the admission and examination regulations
Recommended literature	Molecular Biology of the Cell (Alberts et al., 6th edition)
Useful previous knowledge	Basic knowledge in Cell Biology, Genetics, Biochemistry
Links	https://uol.de/humangenetik/research-and-clinical-collaborations/
Language of instruction	English
Beginning and duration	First half of the winter semester / 0.5 semester
Module frequency and type	annually, required elective
Module capacity	15
Selection criteria	-
Associated with the module	bio680, bio690
Registration proceedings	Stud.IP
Type of examination	written examination (90 min., 70%) and journal presentation (30%)
Additionally ungraded	signed lab protocols and regular active participation is required for the module to be passed

Workload	Course type	SWS	hours
	Lecture	2.00	28 h
	Seminar	1.00	14 h
	Exercise	5.00	70 h
Total attendance		8.00	112 h
Self-Study Time			248 h
Total Workload			360 h

bio695 – Biochemical Concepts in Signal transduction

Module name	Biochemical Concepts in Signal transduction
Module code	bio695
ECTS credit points	12.0 CP
Workload	360 h
Used in study program	M.Sc. Biology, M.Sc. Neuroscience, M.Sc. Molecular Biomedicine
Contact persons	Module Responsibility: <ul style="list-style-type: none"> ○ Prof. Dr. Karl Koch Additional teachers: <ul style="list-style-type: none"> ○ Dr. Alexander Scholten
Emphasis on	Biochemistry and Molecular Neurobiology
Skills to be acquired in this module	++ 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), + teamwork, + project and time management
Module content	Lecture: Molecular fundamentals of cellular signal processes Seminar: Signal transduction Exercises: Experiments on cell signal transduction and enzymology Mechanisms of biochemical signal transduction are imparted theoretically and experimentally.
Prerequisites	as defined in the admission and examination regulations
Recommended literature	Stryer Biochemistry (Berg, Tymoczko, Stryer, 7 th edition); Lehninger Biochemistry (Nelson, Cox, 4 th Edition). Molecular Biology of the Cell (Alberts et al., 6th edition) Current literature on topics of signal transduction (as announced in the preparatory meeting)
Useful previous knowledge	Basic knowledge in Cell Biology, Biochemistry
Links	https://uol.de/en/biochemistry/research/
Language of instruction	English
Beginning and duration	Second half of the winter semester / 0.5 semester
Module frequency and type	annually, required elective
Module capacity	20
Selection criteria	-
Associated with the module	neu190
Registration proceedings	Stud.IP

Type of examination written examination (90 min., 50%), Protocols (50%)

Additionally ungraded

Workload	Course type	SWS	hours
	Lecture	1.00	14 h
	Seminar	1.00	14 h
	Exercise	6.00	84 h
Total attendance		8.00	112 h
Self-Study Time			248 h
Total Workload			360 h

gsw010 – Molecular Physiology

Module name	Molecular Physiology		
Module code	gsw010		
ECTS credit points	6.0 CP		
Workload	180 h		
Used in study program	M.Sc. Molecular Biomedicine		
Contact persons	Module Responsibility: <ul style="list-style-type: none"> ○ Prof. Dr. Ivan Milenkovic Additional teachers: <ul style="list-style-type: none"> ○ n.n. 		
Emphasis on	Physiology of the cell, physiology of human organ systems in health and disease, homeostatic regulation mechanisms		
Skills to be acquired in this module	++ deepened biological expertise ++ deepened clinical/pathological expertise ++ deepened knowledge of biological working methods + data analysis skills + computer based data analysis + interdisciplinary thinking + ability to perform independent biological research + data presentation and discussion (written and spoken)		
Module content	Lecture: cellular mechanisms of excitability, physiology of intercellular communication with emphasis on synaptic transmission, muscle contraction, heart – mechanical and electrical properties, cardiovascular system, lungs – mechanical properties and regulation of respiration, kidney – regulation of diuresis, homeostatic pH regulation, somatosensory system, hearing, vision, central nervous system Exercise: Patch clamp technique – recordings from neurons in acute brain tissue preparation, action potentials, excitatory (EPSCs) and inhibitory postsynaptic currents (IPSCs). Calcium imaging – investigation of excitatory glutamatergic receptors on neurons. In vivo recordings – single cell recordings from central auditory neurons in small rodents. In vivo properties of action potentials and synaptic transmission upon acoustic stimulation.		
Prerequisites	as defined in the admission and examination regulations		
Recommended literature	Guyton and Hall - Textbook of medical physiology; Kandler, Schwarz, Jessell - Principles of neural science; Pape, Kurz, Silbernagl - Physiologie; Schmidt, Lang, Heckmann - Physiologie des Menschen; Speckmann, Hescheler, Köhling - Physiologie		
Useful previous knowledge	Basic knowledge in Physiology and cell biology		
Links	https://uol.de/physiologie		
Language of instruction	English		
Beginning and duration	Second half of the winter semester		
Module frequency and type	annually, required elective		
Module capacity	12		
Selection criteria	-		
Associated with the module	-		
Registration proceedings	Stud.IP		
Type of examination	Oral examination (20 min.)		
Additionally ungraded	-		
Workload	Course type	SWS	hours
	Lecture	2.00	28 h
	Laboratory Exercise	4.00	56 h

Total attendance	6.00	84 h
Self-Study Time		96 h
Total Workload		180 h

gsw020 – Cellular and Subcellular Structures

Module name	Cellular and Subcellular Structures
Module code	gsw020
ECTS credit points	6.0 CP
Workload	180 h
Used in study program	M.Sc. Molecular Biomedicine
Contact persons	Module Responsibility: <ul style="list-style-type: none"> ○ Prof. Dr. Anja Bräuer Additional teachers:
Emphasis on	Cell Biology and Cellular Structures
Skills to be acquired in this module	++ 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 To know and understand cellular and subcellular structures and their function in the human body
Module content	basic overview of different subcellular structures and their function (e.g. Golgi etc.) basic overview of cellular function in different human tissues, including molecular and cellular functions
Prerequisites	as defined in the admission and examination regulations
Recommended literature	Lehrbuch der Histologie, Welsch; Zellbiologie, Kleinig und Maier; Histologie, Lüllmann-Rauch; Histologische Differentialdiagnose, Rohen; Anatomie und Physiologie, Tortora und Derrickson
Useful previous knowledge	basic knowledge in biology, chemistry, mathematics
Links	https://uol.de/anatomie/forschung/
Language of instruction	English
Beginning and duration	First half of the summer semester
Module frequency and type	annually, required elective
Module capacity	25
Selection criteria	-
Associated with the module	-
Registration proceedings	Stud.IP
Type of examination	written examination (45 min.)
Additionally ungraded	-

Workload	Course type	SWS	hours
	Lecture	2.00	28 h
	Exercise	2.00	28 h
Total attendance		4.00	56 h
Self-Study Time			124 h
Total Workload			180 h

gsw030 – Biophysical Chemistry

Module name	Biophysical Chemistry		
Module code	gsw030		
ECTS credit points	6.0 CP		
Workload	180 h		
Used in study program	M.Sc. Molecular Biomedicine		
Contact persons	Module Responsibility: <ul style="list-style-type: none"> ○ Prof. Dr. Michael Winklhofer <p>Additional teachers:</p>		
Emphasis on	Molecular Biophysics, Biophysical Chemistry, Biochemistry, Cell Biology		
Skills to be acquired in this module	<p>++ deepened biological expertise, + data analysis skills, + usage of databases and computational tools + interdisciplinary thinking ++ critical and analytical thinking, ++ data presentation and discussion</p> <p>Understanding physical principles underlying biochemistry and cell biology</p>		
Module content	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)		
Prerequisites	as defined in the admission and examination regulations		
Recommended literature	Principles of Biophysical Chemistry (van Holde et al., Pearson/Prentice Hall); Physical chemistry (Atkins, Wiley VCH); Biophysics - Searching for principles (Bialek, Princeton UP)		
Useful previous knowledge	basic knowledge in biochemistry and physics		
Links			
Language of instruction	English		
Beginning and duration	Second half of the summer semester		
Module frequency and type	annually, required elective		
Module capacity	20		
Selection criteria	-		
Associated with the module			
Registration proceedings	Stud.IP		
Type of examination	15 min. short tests (75%) before each seminar session + oral presentation (25%)		
Additionally ungraded			
Workload	Course type	SWS	hours
	Lecture	2.00	28 h
	Seminar	2.00	28 h
Total attendance		4.00	56 h
Self-Study Time			124 h
Total Workload			180 h

gsw040 – Molecular and Cellular Biology of Hearing and Deafness

Module name	Molecular and Cellular Biology of Hearing and Deafness
Module code	gsw040
ECTS credit points	12.0 CP
Workload	360 h
Used in study program	M.Sc. Molecular Biomedicine
Contact persons	Module Responsibility: <ul style="list-style-type: none"> ○ Dr. Lena Ebbers <p>Additional teachers:</p> <ul style="list-style-type: none"> ○ Dr. Maike Claußen
Emphasis on	auditory neuroscience, molecular and cellular neurobiology
Skills to be acquired in this module	++ 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
Module content	Lecture: 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 Seminar: Discussion of current topics in molecular and cellular biology of hearing and deafness Exercise: Laboratory experiments to study mouse models of deafness/auditory processing disorders
Prerequisites	as defined in the admission and examination regulations
Recommended literature	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 Jeremy M. Wolfe, Keith R. Kluender, Dennis M. Levi, Linda M. Bartoshuk, Rachel S. Herz, Roberta L. Klatzky, and Daniel M. Merfeld, "Sensation & Perception", 2017, Sinauer Vona, B., Haaf, T. (Eds.), "Genetics of Deafness", 2016, Karger Publishers
Useful previous knowledge	basic knowledge in neurogenetics
Links	https://uol.de/en/neurogenetics/research/
Language of instruction	English
Beginning and duration	Second half of the summer semester
Module frequency and type	annually, required elective
Module capacity	8
Selection criteria	
Associated with the module	
Registration proceedings	Stud.IP
Type of examination	presentation (50%), written report (50%)
Additionally ungraded	-

Workload	Course type	SWS	hours
	Lecture	1.00	14 h
	Seminar	2.00	28 h
	Laboratory Exercise	5.00	70 h
Total attendance		8.00	112 h
Self-Study Time			248 h
Total Workload			360 h

gsw050 – Current Topics in Genetics

Module name	Current Topics in Genetics
Module code	gsw050
ECTS credit points	6.0 CP
Workload	180 h
Used in study program	M.Sc. Molecular Biomedicine
Contact persons	Module Responsibility: <ul style="list-style-type: none"> ○ Dr. Lena Ebbers Additional teachers: <ul style="list-style-type: none"> ○ Dr. Maike Claußen
Emphasis on	Genetics
Skills to be acquired in this module	++ 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
Module content	Lecture: 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. Seminar: reading/analyzing current literature in the field
Prerequisites	as defined in the admission and examination regulations
Recommended literature	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.)
Useful previous knowledge	basic knowledge in genetics
Links	https://uol.de/en/neurogenetics/research/
Language of instruction	English
Beginning and duration	Second half of the winter semester
Module frequency and type	annually, required elective
Module capacity	20
Selection criteria	-
Associated with the module	-
Registration proceedings	Stud.IP
Type of examination	written examination (50%), portfolio (50%, Concept paper and short presentation)
Additionally ungraded	-

Workload	Course type	SWS	hours
	Lecture	2.00	28 h
	Seminar	2.00	28 h
Total attendance		4.00	56 h
Self-Study Time			124 h
Total Workload			180 h

neu141 – Visual Neuroscience: Physiology and Anatomy

Module name	Visual Neuroscience - Physiology and Anatomy		
Module code	neu141		
ECTS credit points	12.0 CP		
Workload	360 h		
Used in study program	M.Sc. Neuroscience, M.Sc. Molecular Biomedicine		
Contact persons	Module Responsibility: <ul style="list-style-type: none"> ○ Prof. Dr. Martin Greschner Additional teachers: <ul style="list-style-type: none"> ○ apl Prof. Dr. Ulrike Janssen-Bienhold ○ apl. Prof. Dr. Karin Dedek Dr. Christian Puller 		
Emphasis on	Visual Neuroscience, Molecular Neurobiology, Electrophysiology, Anatomy		
Skills to be acquired in this module	++ deepened biological expertise ++ deepened knowledge of biological working methods ++ data analysis skills + critical and analytical thinking + ability to perform independent biological research + data presentation and discussion (written and spoken) + teamwork		
Module content	Theory: Deeper understanding of the early visual system and improved knowledge of anatomical and physiological research methods. Discussion of scientific work and presentation of own results. Practice: Performing neuroanatomical and electrophysiological experiments. Gaining modern methodological skills.		
Prerequisites	as defined in the admission and examination regulations		
Recommended literature	Masland (2012) The Neuronal Organization of the Retina. Neuron 76, 266-280. Bloomfield and Völgyi (2009) The diverse functional roles and regulation of neuronal gap junctions in the retina. Nat Rev Neurosci. 10(7):495-506. Wässle (2004) Parallel processing in the mammalian retina. Nat Rev Neurosci. 5(10):747-57.		
Useful previous knowledge	basic knowledge in neuroscience		
Links	https://uol.de/en/retina/research/		
Language of instruction	English		
Beginning and duration	First half of the summer semester		
Module frequency and type	annually, required elective		
Module capacity	12		
Selection criteria	-		
Associated with the module	neu150		
Registration proceedings	Stud.IP		
Type of examination	Short tests (10 min each) at the beginning of the seminars and reports on the lab exercises. The tests account for 40% and the reports for 60% of the final grade.		
Additionally ungraded	-		
Workload	Course type	SWS	hours
	Lecture	2.00	28 h
	Laboratory Course	10.00	140 h
Total attendance		12.00	168 h
Self-Study Time			192 h
Total Workload			360 h

neu150 – Visual Neuroscience: Anatomy

Module name	Visual Neuroscience - Anatomy		
Module code	neu150		
ECTS credit points	6.0 CP		
Workload	180 h		
Used in study program	M.Sc. Neuroscience, M.Sc. Molecular Biomedicine		
Contact persons	Module Responsibility: <ul style="list-style-type: none"> ○ apl. Prof. Dr. Ulrike Janssen-Bienhold <p>Additional teachers:</p> <ul style="list-style-type: none"> ○ Prof. Dr. Martin Greschner ○ apl. Prof. Dr. Karin Dedek ○ Dr. Christian Puller 		
Emphasis on	Visual Neuroscience, Molecular Neurobiology, Anatomy		
Skills to be acquired in this module	<p>++ deepened biological expertise</p> <p>++ deepened knowledge of biological working methods</p> <p>++ data analysis skills</p> <p>+ critical and analytical thinking</p> <p>+ ability to perform independent biological research</p> <p>+ data presentation and discussion (written and spoken)</p> <p>+ teamwork</p>		
Module contents	<p>Theory: Deeper understanding of the early visual system and improved knowledge of anatomical research methods. Discussion of scientific work and presentation of own results.</p> <p>Practice: Performing neuroanatomical experiments. Gaining modern methodological skills.</p>		
Prerequisites	as defined in the admission and examination regulations		
Recommended literature	<p>Masland (2012) The Neuronal Organization of the Retina. Neuron 76, 266-280.</p> <p>Bloomfield and Völgyi (2009) The diverse functional roles and regulation of neuronal gap junctions in the retina. Nat Rev Neurosci. 10(7):495-506.</p> <p>Wässle (2004) Parallel processing in the mammalian retina. Nat Rev Neurosci. 5(10):747-57.</p>		
Useful previous knowledge	basic knowledge in neuroscience		
Links	https://uol.de/en/retina/research/		
Language of instruction	English		
Beginning and duration	First half of the summer semester		
Module frequency and type	annually, required elective		
Module capacity	12		
Selection criteria	-		
Associated with the module	neu140		
Registration proceedings	Stud.IP		
Type of examination	Short tests (10 min. each) at the beginning of the seminars and reports on the lab exercises. The tests account for 40% and the reports for 60% of the final grade		
Additionally ungraded	-		
Workload	Course type	SWS	hours
	Lecture	2.00	28 h
	Laboratory Course	5.00	70 h
Total attendance		7.00	98 h
Self-Study Time			82 h
Total Workload			180 h

Clinical Modules

gsw070 – Gene-based Therapies in Human Diseases

Module name	Gene-based Therapies in Human Diseases
Module code	gsw070
ECTS credit points	6.0 CP
Workload	180 h
Used in study program	M.Sc. Molecular Biomedicine
Contact persons	Module Responsibility: <ul style="list-style-type: none"> ○ Prof. Dr. John Neidhardt <p>Additional teachers:</p> <ul style="list-style-type: none"> ○ Dr. Christoph Jüscke
Emphasis on	Translational Research in Human Genetics, Molecular biology, molecular genetics, translational medicine, cell- and neurobiology
Skills to be acquired in this module	<p>++ 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) + team work + project and time management</p> <p>Addressing students with emphasis on translational/therapeutical interest in molecular biology, molecular genetics, cell biology and neurobiology.</p>
Module content	<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>
Prerequisites	as defined in the admission and examination regulations
Recommended literature	Molecular Biology of the Cell (Alberts et al., 6th edition)
Useful previous knowledge	Basic knowledge of Cell Biology, Genetics
Links	https://uol.de/humangenetik/research-and-clinical-collaborations/
Language of instruction	English
Beginning and duration	Second half of the summer semester
Module frequency and type	annually, required elective
Module capacity	15
Selection criteria	-
Associated with the module	-
Registration proceedings	Stud.IP

Type of examination	written examination (90 min.)
Additionally ungraded	signed lab protocols and regular active participation is required for the module to be passed

Workload	Course type	SWS	hours
	Lecture	1.00	14 h
	Seminar	3.00	42 h
Total attendance		4.00	56 h
Self-Study Time			124 h
Total Workload			180 h

gsw080 – Genetic Diagnostics: from chromosomal aberrations to gene mutations

Module name	Genetic Diagnostics: from chromosomal aberrations to gene mutations
Module code	gsw080
ECTS credit points	6.0 CP
Workload	180 h
Used in study program	M.Sc. Molecular Biomedicine
Contact persons	Module Responsibility: <ul style="list-style-type: none"> ○ Dr. Marta Owczarek-Lipska <p>Additional teachers:</p>
Emphasis on	Genome- and gene mutations, cyto- and molecular genetics, human syndromes and diseases caused by different chromosomal aberrations
Skills to be acquired in this module	<p>++ deepened biological and clinical expertise (cytogenetics and molecular genetics)</p> <p>++ deepened knowledge of biological working methods and clinical diagnostics (classical cyto- and molecular genetics laboratory methods)</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>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>
Module content	<p>Lecture: essentials of classical cytogenetics and molecular genetics, classification of mutations, genetics syndromes/diseases, introduction to the genetic diagnostic laboratory techniques</p> <p>Exercises: chromosomal stainings, microscopy, karyotyping, identification of chromosomal aberrations, identification of gene mutations</p>
Prerequisites	as defined in the admission and examination regulations
Recommended literature	<p>Chromosomen: Klassische und molekulare Cytogenetik. Springer-Lehrbuch, W. Traut, EAN: 9783540533191</p> <p>Genetik. Allgemeine Genetik - Molekulare Genetik - Entwicklungsgenetik – W. Janning, EAN: 9783131287717</p> <p>Klassische und molekulare Genetik, C. Bresch, R. Hausmann, EAN: 9783540058021</p> <p>Molekulare Biotechnologie. Konzepte und Methoden, M. Wink, EAN: 9783527309924</p> <p>Essentials of medical genomics. S. M. Brown, EAN: 9780471270614</p>
Useful previous knowledge	basic knowledge of genetics and cell biology
Links	https://uol.de/genetik-gehirnfehlbildungen/forschungsschwerpunkte/
Language of instruction	English
Beginning and duration	Second half of the winter semester
Module frequency and type	annually, required elective
Module capacity	15
Selection criteria	-
Associated with the module	-
Registration proceedings	Stud.IP
Type of examination	written examination (90 min., 70%), presentation (30%)
Additionally ungraded	Signed lab protocols

Workload	Course type	SWS	hours
	Lecture	1.00	14 h
	Seminar	1.00	14 h
	Laboratory Course	2.00	28 h
Total attendance		4.00	56 h
Self-Study Time			124 h
Total Workload			180 h

gsw090 – Current Topics in Clinical Research

Module name	Current Topics in Clinical Research		
Module code	gsw090		
ECTS credit points	6.0 CP		
Workload	180 h		
Used in study program	M.Sc. Molecular Biomedicine		
Contact persons	Module Responsibility: <ul style="list-style-type: none"> ○ n.n. Additional teachers: <ul style="list-style-type: none"> ○ Prof. Dr. Axel Heep ○ n.n. ○ n.n. 		
Emphasis on	foetal and early postnatal life, n.n.		
Skills to be acquired in this module	++ deepened clinical expertise ++ deepened knowledge of biological working methods and clinical diagnostics + data analysis skills ++ interdisciplinary thinking, ++ critical and analytical thinking, + independent searching and knowledge of scientific literature + ethics and professional behavior		
Module content	The module will focus on molecular aspects as part of current clinical research in different fields, e.g.: Molecular insights in the functional brain development, Neural cell migration, synaptogenesis and the development of the connectome are principle mechanisms during foetal and early postnatal life. The goal will be to learn about methods we are using to study molecular intercellular signalling (Nano vesicles, signalling molecules) and about non-invasive methods to study functional brain development (blood oxygenation level dependent response / BOLD / neonatal functional MRI)		
Prerequisites	as defined in the admission and examination regulations		
Recommended literature	Current literature on topics will be provided via Stud.IP		
Useful previous knowledge			
Links			
Language of instruction	English		
Beginning and duration	First half of the winter semester		
Module frequency and type	annually, required elective		
Module capacity	25		
Selection criteria	-		
Associated with the module	-		
Registration proceedings	Stud.IP		
Type of examination	written examination (90 min.)		
Additionally ungraded	-		
Workload	Course type	SWS	hours
	Lecture	4.00	56 h
Total attendance		4.00	56 h
Self-Study Time			124 h
Total Workload			180 h

gsw100 – Immunology and Inflammation

Module name	Immunology and Inflammation
Module code	gsw100
ECTS credit points	6.0 CP
Workload	180 h
Used in study program	M.Sc. Molecular Biomedicine
Contact persons	Module Responsibility: <ul style="list-style-type: none"> ○ Prof. Dr. Ulrike Raap <p>Additional teachers:</p> <ul style="list-style-type: none"> ○ Prof. Dr. Bernhard Gibbs
Emphasis on	Dermatology, Immunology, Inflammation
Skills to be acquired in this module	<p>++ Comprehensive understanding of the fundamentals of immunology and inflammation</p> <p>++ Deepened knowledge of clinical aspects of diseases</p> <p>++ Systematic understanding in the therapy diseases</p> <p>+ Interdisciplinary thinking</p> <p>+ Critical and analytical thinking</p> <p>++ Independent searching and knowledge of scientific literature</p> <p>++ data presentation and discussion (written and spoken)</p> <p>++ teamwork</p> <p>+ time management</p>
Module content	<p>Lectures: Fundamentals of immunology and inflammation</p> <p>Seminars: Worked examples of major inflammatory diseases (e.g. allergies, infections, autoimmune diseases) and advanced therapeutic concepts.</p> <p>Exercises: Students will be expected to demonstrate the ability to prepare presentations in small working groups where they critically evaluate current research regarding specific examples of inflammatory diseases and their therapy (Problem-orientated learning)</p>
Prerequisites	as defined in the admission and examination regulations
Recommended literature	<p>Textbooks: Janeway's Immunobiology; Authors: Kenneth Murphy, Casey Weaver; 2016 (9th Edition; Garland Science), Cellular and Molecular Immunology; Authors: Abul Abbas, Andrew H. Lichtman, Shiv Pillai; 2017 (9th Edition; Elsevier)</p> <p>Example review article: Siebenhaar F, Redegeld FA, Bischoff SC, Gibbs BF, Maurer M. Mast Cells as Drivers of Disease and Therapeutic Targets. Trends Immunol. 2018 Feb;39(2):151-162. doi: 10.1016/j.it.2017.10.005</p>
Useful previous knowledge	Basic knowledge in immunology
Links	https://uol.de/dermatologie/forschung/
Language of instruction	English
Beginning and duration	First half of the winter semester
Module frequency and type	annually, required elective
Module capacity	25
Selection criteria	-
Associated with the module	-
Registration proceedings	Stud.IP
Type of examination	written examination (60 min. 60%), Coursework (short review in English in the Style "News and Views" article; 40%)
Additionally ungraded	formative feedback given for presentations

Workload	Course type	SWS	hours
	Lecture	1.50	21 h
	Seminar	1.00	14 h
	Exercise	1.50	21 h
Total attendance		4.00	56 h
Self-Study Time			124 h
Total Workload			180 h

gsw110 – Clinical Aspects of Degenerative Diseases

Module name	Clinical Aspects of Degenerative Diseases
Module code	gsw110
ECTS credit points	6.0 CP
Workload	180 h
Used in study program	M.Sc. Molecular Biomedicine
Contact persons	Module Responsibility: <ul style="list-style-type: none"> ○ Prof. Dr. Tania Zieschang <p>Additional teachers:</p> <ul style="list-style-type: none"> ○ Prof. Dr. Oliver Dewald
Emphasis on	Geriatric medicine
Skills to be acquired in this module	<p>++ comprehensive understanding of clinical manifestation, epidemiology, risk factors, treatment strategies of degenerative diseases</p> <p>++ understanding of geriatric phenomena</p> <p>++ understanding and application of the comprehensive geriatric assessment (CGA)</p> <p>++ interdisciplinary thinking</p> <p>++ ethics and professional behaviour</p> <p>++ critical and analytical thinking</p> <p>+ independent searching and knowledge of scientific literature</p> <p>++ data presentation and discussion (written and spoken)</p> <p>++ teamwork</p>
Module content	<p>lectures: 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>seminars: instant ageing, the geriatric team, cognitive assessment with actors, work in heart team</p> <p>excursion: small groups (2 students) can accompany clinical rounds on the geriatric ward (either acute geriatric care or geriatric rehabilitation). Conduction of parts of the CGA with patients</p>
Prerequisites	as defined in the admission and examination regulations
Recommended literature	<p>textbooks on geriatric medicine and geriatric psychiatry, e.g. Zeyfang et al. Basiswissen Medizin des Alterns und des alten Menschen. Springer.</p> <p>textbooks on cardiac surgery and cardiology, e.g. Ziemer, Haverich: Herzchirurgie</p> <p>Scientific papers related to current research topics will be available in Stud.IP</p>
Useful previous knowledge	Physiology of cardiovascular system
Links	https://www.aortenklappenregister.de/publikationen-des-registers.html
Language of instruction	English
Beginning and duration	First half of the winter semester
Module frequency and type	annually, required elective
Module capacity	20
Selection criteria	-
Associated with the module	-
Registration proceedings	Stud.IP
Type of examination	written examination (60 min, 70%), case presentation (30%)
Additionally ungraded	-

Workload	Course type	SWS	hours
	Lecture	1.50	21 h
	Seminar	1.50	21 h
	Excursion	1.00	14 h
Total attendance		4.00	56 h
Self-Study Time			124 h
Total Workload			180 h

gsw120 – Tumor Biology

Module name	Tumor Biology
Module code	gsw120
ECTS credit points	6.0 CP
Workload	180 h
Used in study program	M.Sc. Molecular Biomedicine
Contact persons	Module Responsibility: <ul style="list-style-type: none"> ○ Prof. Dr. Frank Griesinger <p>Additional teachers:</p> <ul style="list-style-type: none"> ○ Dr. Julia Roeper
Emphasis on	Oncology
Skills to be acquired in this module	+ deepened biological expertise + deepened knowledge of biological working methods and clinical diagnostics ++ data analysis skills + usage of databases and computational tools ++ 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
Module content	Vorlesung: große Tumorentitäten, Strategien der Therapie, Grundlagen der Karzinogenese und therapeutische Umsetzung. Seminar: Students will be expected to demonstrate the ability to prepare presentations in small working groups where they critically evaluate current research regarding specific examples of tumor diseases and their therapy (Problem-orientated learning) Note: The lectures are part of the study program Human Medicine and will be held in German.
Prerequisites	as defined in the admission and examination regulations
Recommended literature	Textbooks: Richard A. Weinberg (2014): The Biology of Cancer; Poeggel: Kurzlehrbuch Biologie, Thieme Verlag, Stuttgart: 2009; Schaaf et al: Basiswissen Humangenetik, Springer Medizin Verlag, Heidelberg: 2012; Renz-Polster, Herbert; Krautzig, Steffen, Basislehrbuch Innere Medizin, kompakt-greifbar-verständlich - mit Zugang zum Elsevier-Portal, (2012); Krams et al.: Kurzlehrbuch Pathologie, Thieme Verlag, Stuttgart: 2010. Current literature will be uploaded on Stud.IP
Useful previous knowledge	Basic knowledge of genetics and cell-biology
Links	
Language of instruction	English and German
Beginning and duration	Semester break, after winter term
Module frequency and type	annually, required elective
Module capacity	25
Selection criteria	-
Associated with the module	-
Registration proceedings	Stud.IP
Type of examination	written examination (45 min., 75%), presentation (25%)
Additionally ungraded	-

Workload	Course type	SWS	hours
	Lecture	2.00	28 h
	Seminar	2.00	28 h
Total attendance		4.00	56 h
Self-Study Time			124 h
Total Workload			180 h

gsw130 - Regenerative Medicine in Ophthalmology

Module name	Regenerative Medicine in Ophthalmology
Module code	gsw130
ECTS credit points	6.0 CP
Workload	180 h
Used in study program	M.Sc. Molecular Biomedicine
Contact persons	Module Responsibility: <ul style="list-style-type: none"> ○ Dr. Sonja Mertsch <p>Additional teachers:</p>
Emphasis on	Regenerative Medicine in Ophthalmology
Skills to be acquired in this module	<p>++ comprehensive understanding of the fundamentals of regenerative ophthalmology research</p> <p>++ Deepened knowledge of clinical aspects of eye diseases</p> <p>++ deepened knowledge of biological working methods and clinical diagnostics (classical tissue engineering, cell culture and molecular laboratory methods)</p> <p>++ Systematic understanding in translational research</p> <p>+ Interdisciplinary thinking</p> <p>+ Critical and analytical thinking</p> <p>++ data analysis and interpretation skills</p> <p>++ data presentation and discussion (written and spoken)</p> <p>++ teamwork</p> <p>+ time management</p>
Module content	<p>- Lectures: Fundamentals of ophthalmologic diseases and insights of current ophthalmologic research projects including tissue engineering methods</p> <p>- Exercises: practical laboratory work: generation of tissue engineered artificial cornea, preparation of porcine cornea and retina, cultivation of primary corneal stem cells, sample preparation for protein and mRNA, Western Blotting, PCR, Paraffin sectioning, HE-staining</p>
Prerequisites	as defined in the admission and examination regulations
Recommended literature	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.
Useful previous knowledge	basic knowledge of cell culture methods, protein and mRNA isolation methods
Links	
Language of instruction	English
Beginning and duration	winter semester
Module frequency and type	annually, required elective
Module capacity	5
Selection criteria	-
Associated with the module	-
Registration proceedings	Stud.IP
Type of examination	Portfolio: Short written lab report (max. 8 pages) and presentation (20 min.) of recent research papers
Additionally ungraded	

Workload	Course type	SWS	hours
	Lecture	1.00	14 h
	Exercise	3.00	42 h
Total attendance		4.00	56 h
Self-Study Time			124 h
Total Workload			180 h

Research Modules

gsw150 – Research Project Molecular Biomedicine

Module name	Research Project Molecular Biomedicine
Module code	gsw150
ECTS credit points	15.0 CP
Workload	450 h
Used in study program	M.Sc. Molecular Biomedicine
Contact persons	Module Responsibility: <ul style="list-style-type: none"> ○ Prof. Dr. Karl Koch <p>Additional teachers:</p> <ul style="list-style-type: none"> ○ All teachers of the curriculum
Emphasis on	Research
Skills to be acquired in this module	<p>++ deepened biological and / or clinical expertise</p> <p>++ deepened knowledge of biological working methods and / or 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>+ ethics and professional behaviour</p> <p>+ project and time management</p>
Module content	<p>Theory and practice of topics related to issues in molecular biomedicine; independent treatment of an individual project; acquiring an advanced theoretical knowledge in selected fields of the molecular biology of the cell (points of emphasis: genetics, biochemistry, cell biology; topics depending on research groups)</p> <p>There are several options for the lab projects, for example in the broad categories of:</p> <p>https://uol.de/en/neurosciences/</p> <ul style="list-style-type: none"> ○ https://uol.de/en/biochemistry/research/ ○ https://uol.de/en/neurogenetics/research/ ○ https://uol.de/en/retina/research/ <p>https://uol.de/humanmedizin/</p> <ul style="list-style-type: none"> ○ https://uol.de/anatomie/forschung/ ○ https://uol.de/dermatologie/forschung/ ○ https://uol.de/humangenetik/research-and-clinical-collaborations/ ○ https://uol.de/genetik-gehirnfehlbildungen/forschungsschwerpunkte/ ○ https://uol.de/augenheilkunde/forschungsschwerpunkte/
Prerequisites	as defined in the admission and examination regulations
Recommended literature	Specific literature of the topics indicated above; original papers related to the current research question; will be different for every student and every year
Useful previous knowledge	Basic knowledge of Cell Biology, Genetics, Biochemistry or Clinical Biomedicine
Links	
Language of instruction	English
Beginning and duration	every semester, time is flexible and subject to individual arrangement
Module frequency and type	annually, required elective
Module capacity	unlimited
Selection criteria	-

Associated with the module	-		
Registration proceedings	Stud.IP		
Type of examination	signed project report		
Additionally ungraded	participation in seminar and 30 min. presentation during the semester on a topic depending on the chosen option		
Workload	Course type	SWS	hours
	Seminar	0.50	7 h
	Exercise	9.50	133 h
Total attendance		10.00	140 h
Self-Study Time			310 h
Total Workload			450 h

gsw160 – External Research Project Molecular Biomedicine

Module name	External Research Project Molecular Biomedicine		
Module code	gsw160		
ECTS credit points	15.0 CP		
Workload	450 h		
Used in study program	M.Sc. Molecular Biomedicine		
Contact persons	Module Responsibility: <ul style="list-style-type: none"> ○ Prof. Dr. Karl Koch Additional teachers: <ul style="list-style-type: none"> ○ All teachers of the curriculum 		
Emphasis on	Research		
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 content	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).		
Prerequisites	as defined in the admission and examination regulations		
Recommended literature	Specific literature of the topics indicated above; original papers related to the current research question; will be different for every student and every year		
Useful previous knowledge	Basic knowledge of Cell Biology, Genetics, Biochemistry or Clinical Biomedicine		
Links			
Language of instruction	English		
Beginning and duration	every semester, time is flexible and subject to individual arrangement		
Module frequency and type	annually, required elective		
Module capacity	unlimited		
Selection criteria	-		
Associated with the module			
Registration proceedings	Stud.IP		
Type of examination	signed project report		
Additionally ungraded	(participation in seminar and) 30 min. presentation during the semester on a topic depending on the chosen option		
Workload	Course type	SWS	hours
	Seminar	0.50	7 h
	Exercise	9.50	133 h
Total attendance		10.00	140 h
Self-Study Time			310 h
Total Workload			450 h

Skills Modules

gsw170 – Research Techniques Molecular Biomedicine

Module name	Research Techniques Molecular Biomedicine
Module code	gsw170
ECTS credit points	6.0 CP
Workload	180 h
Used in study program	M.Sc. Molecular Biomedicine
Contact persons	Module Responsibility: <ul style="list-style-type: none"> ○ Dr. Anna-Maria Hartmann <p>Additional teachers:</p>
Emphasis on	Competence in Research Methods
Skills to be acquired in this module	++ 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)
Module content	Basic knowledge of techniques used in neuroscience Seminar Topics: 1. Hybridization and Detection of Nucleic Acid, 2. Polymerase Chain Reaction, 3. Nucleic acid sequencing, 4. analyses of epigenetic modifications, 5. protein-Nucleic Acid Interaction, 6. Immunological Techniques, 7. Light Microscopy Techniques, 8. Mass Spectrometry Analyses, 9. Protein-Protein Interactions, 10. Fluorescence in situ Hybridization Practical course: molecular biological techniques (PCR, Agarose gel, plasmid preparation, restriction), immunological methods (cell culturing, cytochemistry), biochemistry techniques (SDS gel, western blotting, protein purification, photometry)
Prerequisites	as defined in the admission and examination regulations
Recommended literature	Bioanalytics: Analytical Methods and Concepts in Biochemistry and Molecular Biology, Lottspeich and Engels (ISBN-13: 978-3527339198)
Useful previous knowledge	
Links	
Language of instruction	English
Beginning and duration	Second half of the winter semester
Module frequency and type	annually, required elective
Module capacity	25
Selection criteria	-
Associated with the module	-
Registration proceedings	Stud.IP
Type of examination	20 min. presentation (talk about one seminar topic)
Additionally ungraded	-

Workload	Course type	SWS	hours
	Seminar	2.00	28 h
	Laboratory Course	2.00	28 h
Total attendance		4.00	56 h
Self-Study Time			124 h
Total Workload			180 h

gsw180 – Ethics in Medicine

Module name	Ethics in Medicine		
Module code	gsw180		
ECTS credit points	3.0 CP		
Workload	90 h		
Used in study program	M.Sc. Molecular Biomedicine		
Contact persons	Module Responsibility: <ul style="list-style-type: none"> ○ Prof. Dr. Mark Schweda <p>Additional teachers:</p>		
Emphasis on	Ethics		
Skills to be acquired in this module	<p>++ deepened medical / ethical expertise with a focus on research ethics</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>++ ethics and professional behaviour</p> <p>+ project and time management</p>		
Module content	<p>Concept of ethics and central theoretical approaches to ethics</p> <p>Research ethical standards and their evolution</p> <p>Good scientific practice (scientific misconduct, criteria of authorship, documentation of research, IRB approval)</p> <p>Central areas of ethically sensitive research (stem cell and embryonic research, genomic research, clinical studies, social research)</p> <p>Ethical problems in research (research with incompetent and vulnerable populations)</p> <p>Central research ethical concepts (informed consent, risk assessment, confidentiality, data protection)</p>		
Prerequisites	as defined in the admission and examination regulations		
Recommended literature	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		
Useful previous knowledge	-		
Links	https://uol.de/medizinetik/		
Language of instruction	English		
Beginning and duration	Second half of the winter semester		
Module frequency and type	annually, required elective		
Module capacity	25		
Selection criteria	-		
Associated with the module	-		
Registration proceedings	Stud.IP		
Type of examination	Written examination (60 min.)		
Additionally ungraded	-		
Workload	Course type	SWS	hours
	Lecture	2.00	28 h
Total attendance		2.00	28 h
Self-Study Time			62 h
Total Workload			90 h

gsw190 – Journal Club

Module name	Journal Club		
Module code	gsw190		
ECTS credit points	3.0 CP		
Workload	90 h		
Used in study program	M.Sc. Molecular Biomedicine		
Contact persons	Module Responsibility: <ul style="list-style-type: none"> ○ Prof. Dr. Karl Koch <p>Additional teachers: all teachers of the curriculum</p>		
Emphasis on	Current Topics in Molecular Cell Biology and Biomedicine		
Skills to be acquired in this module	++ 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)		
Module content	Original literature of molecular life science related to health and disease		
Prerequisites	as defined in the admission and examination regulations		
Recommended literature	Specific literature of the topics indicated above; original papers related to the current research question; will be different for every student and every year. Textbooks of Cell Biology, Biochemistry, Genetics: Alberts et al. Molecular Biology of the Cell (5th Edition or later); Stryer Biochemistry (7th Edition or later); Lehninger Biochemistry (4th Edition or later). These textbooks are updated almost every 3 or 4 years		
Useful previous knowledge	Basic knowledge of Cell Biology, Genetics, Biochemistry		
Links			
Language of instruction	English		
Beginning and duration	recommended in semester 3, time is flexible and subject to individual arrangement		
Module frequency and type	annually, required elective		
Module capacity	-		
Selection criteria	-		
Associated with the module	-		
Registration proceedings	Stud.IP		
Type of examination	Portfolio: Presentation of journal articles, 2 presentations à 20 min.		
Additionally ungraded	-		
Workload	Course type	SWS	hours
	Seminar	2.00	28 h
Total attendance		2.00	28 h
Self-Study Time			62 h
Total Workload			90 h

gsw200 – Microscopic Imaging in Biomedical Sciences

Module name	Microscopic Imaging in Biomedical Sciences		
Module code	gsw200		
ECTS credit points	3.0 CP		
Workload	90 h		
Used in study program	M.Sc. Molecular Biomedicine		
Contact persons	Module Responsibility: <ul style="list-style-type: none"> ○ apl. Prof. Dr. Karin Dedek Additional teachers: <ul style="list-style-type: none"> ○ PD Dr. Petra Groß 		
Emphasis on	Microscopy, Imaging, Methods of Microscopy		
Skills to be acquired in this module	+ 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 content	Lectures: Basics in optics, microscopy methods, image processing, biomedical applications Seminar: Examples for selected microscopy methods and their application Different microscopical methods and their applications are discussed and compared. Students will understand the basics and limitations of microscopy methods and learn to evaluate them. Selected methods are demonstrated.		
Prerequisites	as defined in the admission and examination regulations		
Recommended literature	Literature will be provided during the lecture/seminar		
Useful previous knowledge	Basic physics, basic cell biology		
Links			
Language of instruction	English		
Beginning and duration	afternoon event during winter semester		
Module frequency and type	annually, required elective		
Module capacity	16		
Selection criteria	attendance at first meeting		
Associated with the module	-		
Registration proceedings	Stud.IP		
Type of examination	Journal presentation (40%), written examination (60 min., 60%). Note: to qualify for the exam, regular participation during the semester is mandatory, no more than 2 days of absence		
Additionally ungraded	-		
Workload	Course type	SWS	hours
	Seminar	2.00	28 h
Total attendance		2.00	28 h
Self-Study Time			62 h
Total Workload			90 h

neu751 – Laboratory Animal Science

Module name	Laboratory Animal Science
Module code	neu751
ECTS credit points	3.0 CP
Workload	90 h
Used in study program	M.Sc. Neuroscience
Contact persons	<p>Module Responsibility:</p> <ul style="list-style-type: none"> ○ Prof. Dr. Christine Köppl <p>Additional teachers:</p> <ul style="list-style-type: none"> ○ Prof. Dr. Georg Klump ○ Dr. Ulrike Langemann
Emphasis on	Laboratory Animal Science
Skills to be acquired in this module	<p>+ deepened biological expertise ++ deepened knowledge of biological working methods + data analysis skills ++ interdisciplinary thinking ++ independent searching and knowledge of scientific literature ++ ability to perform independent biological research ++ data presentation and discussion (written and spoken) ++ teamwork ++ ethics and professional behaviour</p> <p>Upon successful completion of this course, students</p> <ul style="list-style-type: none"> • know the relevant EU legislation governing animal welfare and are able to explain its meaning in common language • understand and are able to critically discuss salient ethical concepts in animal experimentation, such as the three Rs and humane endpoint. • have basic knowledge of the biology and husbandry of laboratory animal species held at the University of Oldenburg (rodents or birds or fish) • are able to critically assess the needs and welfare of animals without compromising scientific integrity of the investigation • have practical skills in handling small rodents or birds or fish • have profound knowledge of anaesthesia, analgesia and basic principles of surgery. • have practised invasive procedures and euthanasia. <p>NOTE: These objectives aim to satisfy the requirements for EU directive A „Persons carrying out animal experiments“ and EU directive D „Persons killing animals“. We aim to obtain accreditation by the Federation of European Laboratory Animal Science Associations (FeLaSa)</p>
Module content	<p>Background knowledge is taught using the third-party online platform "LAS Interactive" which concludes with a written exam that has to be passed before the practical part. Topics covered are:</p> <ul style="list-style-type: none"> • Legislation, ethics and the 3Rs • Scientific integrity and Data collection • Basic biology of rodents, birds and fish • Husbandry, and nutrition of rodents, birds and fish • Animal Welfare and Health monitoring • Pain and distress • Euthanasia <p>Practical procedures will first be demonstrated, important aspects will then be practiced under supervision by every participant, on an animal model of their choice (rodents, birds or fish):</p> <ul style="list-style-type: none"> • Handling and external examination • Administration of substances, blood sampling • Euthanasia and dissection

	<ul style="list-style-type: none"> • Transcardial perfusion • Anaesthesia and surgery
Prerequisites	as defined in the admission and examination regulations
Recommended literature	
Useful previous knowledge	"LAS interactive" internet-based learning platform
Links	
Language of instruction	English
Beginning and duration	Semester break, one week full-time + flexible time for studying and exam preparation
Module frequency and type	annually, required elective
Module capacity	15
Selection criteria	participants who require the skills by law have priority
Associated with the module	-
Registration proceedings	Stud.IP
Type of examination	Written examination (90 min.)
Additionally ungraded	-

Workload	Course type	SWS	hours
	Lecture	1.00	14 h
	Supervised Exercise	1.00	14 hh
Total attendance		2.00	28 h
Self-Study Time			62 h
Total Workload			90 h

neu760 – Scientific English

Module name	Scientific English		
Module code	neu760		
ECTS credit points	6.0 CP		
Workload	180 h		
Used in study program	M.Sc. Neuroscience, M.Sc. Molecular Biomedicine		
Contact persons	Module Responsibility: <ul style="list-style-type: none"> ○ Prof. Dr. Jannis Hildebrandt <p>Additional teachers:</p> <ul style="list-style-type: none"> ○ outsourced to “STELS-OL” native English speaker with in-depth neuroscience knowledge 		
Emphasis on	Scientific English		
Skills to be acquired in this module	+ Interdisciplinary thinking + Independent searching and knowledge of scientific literature ++ data presentation and discussion (written and spoken) ++ team work and social skills <p>Upon completion of this course, students have increased their proficiency in different forms of scientific presentation and communication in English, with special emphasis on neuroscience and are able to express themselves with correct sentence structure and grammar, correct use of idioms and correct pronunciation. Furthermore students are proficient in different contexts of scientific communication (e.g., paper, poster and informal exchange by email or phone) and are able to recognize and avoid common errors of non-native speakers.</p>		
Module content	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.		
Prerequisites	as defined in the admission and examination regulations		
Recommended literature	http://users.wpi.edu/~nab/sci_eng/ScientificEnglish.pdf		
Useful previous knowledge	English level B2 according to Common European Framework of Reference for Languages (CEFR)		
Links	http://users.wpi.edu/~nab/sci_eng/ScientificEnglish.pdf		
Language of instruction	English		
Beginning and duration	semester break before summer term		
Module frequency and type	annually, required elective		
Module capacity	12		
Selection criteria	-		
Associated with the module	-		
Registration proceedings	Stud.IP		
Type of examination	presentation (50%), assignment (50%)		
Additionally ungraded	-		
Workload	Course type	SWS	hours
	Lecture	1.00	14 h
	Supervised Exercise	3.00	42 h
Total attendance		4.00	56 h
Self-Study Time			124 h
Total Workload			180 h

Master Thesis Module

mam – Master Thesis Module

Module name	Master Thesis Module
Module code	mam
ECTS credit points	30.0 CP
Workload	900 h
Used in study program	M.Sc. Molecular Biomedicine
Contact persons	Module Responsibility: <ul style="list-style-type: none"> ○ All teachers of the curriculum
Emphasis on	Research
Skills to be acquired in this module	<ul style="list-style-type: none"> ++ deepened biological and / or clinical expertise ++ deepened knowledge of biological working methods and / or clinical diagnostics ++ data analysis skills + 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 content	<p>Preparation of the Master Thesis. There are several options for the lab projects, e.g. in the broad categories of:</p> <p>https://uol.de/en/neurosciences/</p> <ul style="list-style-type: none"> ○ https://uol.de/en/biochemistry/research/ ○ https://uol.de/en/neurogenetics/research/ ○ https://uol.de/en/retina/research/ <p>https://uol.de/humanmedizin/</p> <ul style="list-style-type: none"> ○ https://uol.de/anatomie/forschung/ ○ https://uol.de/dermatologie/forschung/ ○ https://uol.de/humangenetik/research-and-clinical-collaborations/ ○ https://uol.de/genetik-gehirnfehlbildungen/forschungsschwerpunkte/
Prerequisites	as defined in the admission and examination regulations
Recommended literature	Specific literature of the topics indicated above; original papers related to the current research question
Useful previous knowledge	
Links	
Language of instruction	English
Beginning and duration	recommended in semester 4, time is flexible and subject to individual arrangement
Module frequency and type	annually, mandatory
Module capacity	individual arrangement
Selection criteria	-
Associated with the module	-
Registration proceedings	Stud.IP

Type of examination	Master Thesis (90%), oral presentation (colloquium, 10%)
Additionally ungraded	presentation during the semester on a topic depending on the chosen option; participation in seminar

Workload	Course type	SWS	hours
	Seminar	1.00	14 h
	Exercise	29.00	406 h
Total attendance		30.00	420 h
Self-Study Time			480 h
Total Workload			900 h