Modulhandbuch

Neuroscience - Master's Programme

im Wintersemester 2020/2021

erstellt am 28/03/24

Modules for Neuroscience

Date 28/03/24

Background Modules

neu210 - Neurosensory Science and Behaviour

Module label	Neurosensory Science and Behaviour
Modulkürzel	neu210
Credit points	9.0 KP
Workload	270 h (4 SWS Lecture (VO) "Neuroethology" and "Behavioural ecology" Total workload 180h: 56h contact/ 60h background reading/ 64h exam preparation 2 SWS Seminar (SE) "Current issues of ethology" Total workload 90h: 28h contact/ 30h literature reading/ 32h preparation of presentation)
Verwendbarkeit des Moduls	• Master's Programme Biology (Master) > Background Modules • Master's Programme Biology (Master) > Background Modules • Master's Programme Neuroscience (Master) > Background Modules
Zuständige Personen	• Langemann, Ulrike (module responsibility) • Langemann, Ulrike (Module counselling) • Mouritsen, Henrik (Module counselling) • Klump, Georg Martin (Prüfungsberechtigt) • Mouritsen, Henrik (Prüfungsberechtigt) • Langemann, Ulrike (Prüfungsberechtigt) • Albert, Jörg (Prüfungsberechtigt) • Clemens, Jan (Prüfungsberechtigt)
Prerequisites	Fundamentals of Neurobiology, Bahavioural Biology, Evolution, Ecology
Skills to be acquired in this module	++ Neurosci. knowlg. + Expt. methods + Independent research + Scient. literature + Social skills ++ Interdiscipl. knowlg. Maths/Stats/Progr. + Data present./disc. + Scientific English Ethics Upon successful completion of this course, students • know the fundamentals of behavioural ecology and neuroethology • are able to present and critically assess scientific data and approaches
Module contents	The lecture "Neuroethology" provides an introduction to the mechanisms underlying the behaviour of animals. Subjects are, e.g., the mechanisms of perception, control of movement patterns, mechanisms of learning, orientation and navigation. The lecture "Behavioural ecology" provides an introduction to topics such as predator-prey interactions, optimal food utilization, spatial and temporal distribution of animals, social relations and group formation, mating systems and reproductive strategies, sexual selection, investment of parents in offspring, and communication. In the seminar "Current issues of Ethology", current original literature relating to behavioural biology is reported and discussed.
Literaturempfehlungen	Carew TJ (2004) Behavioral Neurobiology: The Cellular Organization of Natural Behavior. Sinauer Davis NB, Krebs JR, West SA (2012) An Introduction to Behavioural Ecology. Wiley Blackwell
Links	
Language of instruction	English
Duration (semesters)	1 Semester
Module frequency	jährlich
Module capacity	30 (Recommended in combination with: neu220 BM "Neurocognition and Psychopharmacology" Shared course components with (cannot be credited twice): bio610 (5.02.611 "Neuroethologie", 5,02,612 "Verhaltensökologie", 5.02.613 "Aktuelle Themen der Ethologie")

Reference text	Course in the second half of the semester Regular active participation is required to pass the module.

Examination	Prüfungszeiten	Type of examination
Final exam of module	as agreed, usually in the break after the winter term	80% written exam (content of the two lecture series), 20% presentation(s)

Form of instruction	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		4		56
Seminar		2		28
Präsenzzeit Modul insgesamt				84 h

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 excercise (UE) Total workload 45h: 14h contact/ 31h paper reading)
Verwendbarkeit des Moduls	• Master's Programme Biology (Master) > Background Modules • Master's Programme Biology (Master) > Background Modules • Master's Programme Molecular Biomedicine (Master) > Background Modules • Master's Programme Neuroscience (Master) > Background Modules
Zuständige Personen	• Thiel, Christiane Margarete (module responsibility) • Thiel, Christiane Margarete (Module counselling) • Thiel, Christiane Margarete (Prüfungsberechtigt) • Gießing, Carsten (Prüfungsberechtigt)
Prerequisites	
Skills to be acquired in this module	++ Neurosci. knowlg. + Expt. methods Independent research + Scient. literature + Social skills ++ Interdiscipl. knowlg. Maths/Stats/Progr. + Data present./disc. + Scientific English Ethics 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 priniciples of drug treatement 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 neurosciene
Module contents	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 excersise either deepens that knowledge by excersises 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
Literaturempfehlungen	Ward J (2010) The Student's Guide to Cognitive Neuroscience. Psychology

	Press Meyer JS and Quenzer LF (2012) Psychopharmacology. Sinauer
Links	
Language of instruction	English
Duration (semesters)	1 Semester
Module frequency	jährlich
Module capacity	30 (Recommended in combination with neu210 "Neurosensory Science and Behaviour", neu300 "Functional MRI data analysis" Shared course components with (cannot be credited twice): bio610 and psy181 (5.02.614 "Introduction to Cognitive Neuroscience", 5.02.615 "Psychopharmacology"))
Reference text	Course in the second half of the semester Regular active participation is required to pass the module.

Examination	Prüfungszeiten	Type of examination
Final exam of module	as agreed, usually in the break after the winter term	100% written exam (content of the lectures)

Form of instruction	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		3	--	42
Exercises		1	--	14
Präsenzzeit Modul insgesamt				56 h

neu250 - Computational Neuroscience - Statistical Learning

Module label	Computational Neuroscience - Statistical Learning
Modulkürzel	neu250
Credit points	6.0 KP
Workload	180 h (1 SWS Lecture (VL) Total workload 36 h: 14 h contact / 22 h individual revision of lecture contents, test preparation, and application to portfolio tasks 1 SWS Seminar (SE) Total workload 36 h: 14 h contact / 22 h individual reading and test preparation 3 SWS Supervised exercise Total workload 108 h: 42 h contact/ 66 h individual work on portfolio tasks (programming and interpretation of simulation or analysis results))
Verwendbarkeit des Moduls	• Master's Programme Neuroscience (Master) > Background Modules
Zuständige Personen	• Anemüller, Jörn (module responsibility) • Anemüller, Jörn (Module counselling) • Rieger, Jochem (Module counselling) • Rieger, Jochem (Prüfungsberechtigt) • Anemüller, Jörn (Prüfungsberechtigt) • Kretzberg, Jutta (Prüfungsberechtigt)
Prerequisites	attendance in pre-meeting
Skills to be acquired in this module	Upon successful completion of this course, students • have refined their programming skills (in Matlab) in order to efficiently analyze large-scale experimental data • are able to implement a processing chain of prefiltering, statistical analysis and results visualization • have acquired an understanding of the theoretical underpinnings of the most common statistical analysis methods and basic machine learning principles • have practised using existing toolbox functions for complex analysis tasks • know how to implement new analysis algorithms in software from a given mathematical formulation • can interpret analysis results in a neuroscientific context • have applied these techniques to both single channel and multi-channel neurophysiological data ++ Neurosci. knowlg. + Scient. literature + Social skills ++ Interdiscipl. knowlg. ++ Maths/Stats/Progr. + Data present./disc. + Scientific English
Module contents	 • data preprocessing, e.g., artifact detection and rejection, filtering, z-scoring, epoching • data handling for high-volume data in Matlab • introduction to relevant analysis toolbox software • theory of multi-dimensional statistical analysis approaches, such as multi-dimensional linear • regression, principal component analysis, independent component analysis, logistic regression, • gradient-based optimization • practical implementation from mathematical formulation to software code, debugging and unit testing • postprocessing and results visualization • consolidation during hands-on computer-based exercises (in Matlab) • introduction to selected specialized analysis approaches during the seminar

Literaturempfehlungen	Wallisch et al.: MATLAB for Neuroscientists, 2nd Ed. Academic Press. More text books will be suggested prior to the course. Scientific articles: Copies of scientific articles for the seminar will be provided prior to the course
Links	
Language of instruction	English
Duration (semesters)	1 Semester
Module frequency	jährlich
Module capacity	18 (Recommended in combination with neu240 Computational Neuroscience - Introduction Shared course components with (cannot be credited twice): psy220 Human Computer Interaction)
Reference text	Course in the first half of the semester Students without Matlab experience should take the optional Matlab course (1. week) of Computational Neuroscience - Introduction
Previous knowledge	Programming experience is highly recommended, preferably in Matlab

Examination	Prüfungszeiten	Type of examination
Final exam of module	during the course	Portfolio, consisting of daily short tests, programming exercises and short reports

Form of instruction	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		1	--	14
Exercises		3	--	42
Seminar		1	--	14
Präsenzzeit Modul insgesamt				70 h

neu241 - Computational Neuroscience - Introduction

Module label	Computational Neuroscience - Introduction
Modulkürzel	neu241
Credit points	12.0 KP
Workload	360 h (360 h 2 SWS Lecture Total workload 60h: 30h contact/30h individual revision of lecture contents, test preparation 1 SWS Seminar Total workload 45h: 15h contact/30h individual reading and test preparation 10.5 SWS Supervised exercise Total workload 255h: 145h contact/110h individual work on portfolio tasks (programming, interpretation of simulation results))
Verwendbarkeit des Moduls	• Master's Programme Neuroscience (Master) > Background Modules
Zuständige Personen	• Kretzberg, Jutta (module responsibility) • Kretzberg, Jutta (Module counselling) • Kretzberg, Jutta (Prüfungsberechtigt) • Greschner, Martin (Prüfungsberechtigt) • Ashida, Go (Prüfungsberechtigt)
Prerequisites	Programming experience in Matlab (e.g. acquired by a 6 ECTS programming course)
Skills to be acquired in this module	++ Neurosci. knowlg. + Scient. Literature + Social skills ++ Interdiscipl. knowlg ++ Maths/Stats/Progr. + Data present./disc. + Scientific EnglishUpon successful completion of this course, students • are able to implement and apply algorithms in Matlab • have learned to handle scientific data independently • have acquired theoretical and practical knowledge of advanced data analyis techniques • know about computational model approaches on different levels of abstraction • know how to perform model simulations for single cells and small neuronal networks • can interpret simulation results in a neuroscientific context
Module contents	This course consists of six weeks with different topics, which are introduced in lectures, discussed in depth using selected literature in the seminar and consolidated in computer-based hands-on exercises (in Matlab). Portfolio tasks, mainly interpretation of programming results are given every day. Weeks 1 and 2: Spike train analysis response tuning, spike triggered average, receptive fields, linear-nonlinear model, spike correlation, linear reconstruction, classification Weeks 3 and 4: Neuron models Conductance-based single cell models using differerential equations (passive membrane equation, integrate and fire, Hodgkin Huxley, alpha synapses) Weeks 5 and 6: Small network models Feed-forward and feed-back networks, lateral inhibition, central pattern generator, spike-timing dependent plasticity, multi-compartment models
Literaturempfehlungen	

	Skripts for each course day will be provided prior to / during the course Copies of scientific articles for the seminar and as basis for portfolio assignments will be provided prior to the course Recommended textbooks or other literature: Dayan / Abbott: Theoretical Neuroscience: Computational and Mathematical Modeling of Neural Systems. MIT Press (More text book chapters will be suggested prior to the course).
Links	
Language of instruction	English
Duration (semesters)	1 Semester
Module frequency	annually
Module capacity	18 (Registration procedure / selection criteria: StudIP; sequence of registration, attandance in pre-meeting Recommended in combination with: neu770 Neuroscientific data analysis in Matlab (prior to the course) neu250 Computational Neuroscience - Statistical Learning (after the course))

Examination	Prüfungszeiten	Type of examination
Final exam of module	during the course	Portfolio, consisting of daily short tests, programming exercises, short reports

Form of instruction	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		2	WiSe	28
Seminar		1	WiSe	14
Exercises		10	WiSe	147
Präsenzzeit Modul insgesamt				189 h

neu280 - Research Techniques in Neuroscience

Module label	Research Techniques in Neuroscience
Modulkürzel	neu280
Credit points	6.0 KP
Workload	180 h (2 SWS Lecture: 35 h contact / 45 h background reading / 10 h exam preparation 2 SWS Practical: 50 h contact / 30 h protocol preparation / 10 h exam preparation)
Verwendbarkeit des Moduls	• Master's Programme Neuroscience (Master) > Background Modules
Zuständige Personen	• Hartmann, Anna-Maria (module responsibility) • Hartmann, Anna-Maria (Module counselling) • Bantel, Carsten (Prüfungsberechtigt) • Greschner, Martin (Prüfungsberechtigt) • Hurlemann, René (Prüfungsberechtigt) • Hartmann, Anna-Maria (Prüfungsberechtigt) • Neidhardt, John (Prüfungsberechtigt) • Nothwang, Hans Gerd (Prüfungsberechtigt) • Thiel, Christiane Margarete (Prüfungsberechtigt)
Prerequisites	
Skills to be acquired in this module	+ Neurosci. knowlg. ++ Expt. Methods + Scient. Literature + Social skills + Interdiscipl. knowlg. + Maths/Stats/Progr. + Data present./disc. + Scientific English ++ Ethics 1. have basic knowledge of different techniques (see content of the module) used in neurosciences 2. have basic knowledge of realizing clinical studies, generating questionaires and their biostatistical data analyses 3. have aquired practical skills in whole brain imaging (fMRI) and molecular techniques 4. have aquired practical skills in performing clinical studies
Module contents	Lecture topics: 1. Whole brain imaging (CT, MRI, fMRI, PET, EEG, MEG) 2. Animal Behaviour 3. Microscopy and Visualizing nervous system structure 4. Electrophysiology 5. Identifying Gene of Interest and Gene delivery strategies 6. Molecular Cloning, generation of transgenic organism, manipulating endogenous genes 7. Cell culture techniques 8. Biochemical assays and intracellular signalling 9. Clinical studies 10. questionaire and biostatistics 11. judical basics of scientific work laboratory course 1. molecular methods (site directed mutagenesis, PCR, midi preparation, sequencing, bioinformatics) 2. fMRI 3. clinical studies
Literaturempfehlungen	Guide to Research Techniques in Neuroscience, 2nd EditionAuthor(s) : Carter & Shieh Print Book ISBN : 9780128005118 eBook ISBN : 9780128005972
Links	
Language of instruction	English
Duration (semesters)	1 Semester
Module frequency	summer term / annually

Module capacity	20 (Registration procedure / selection criteria: StudIP)

Examination	Prüfungszeiten	Type of examination
Final exam of module	end of semester	written exam

Form of instruction	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture (Lecture)		2	SoSe	28
Practical training (Practical)		2	SoSe	28
Präsenzzeit Modul insgesamt				56 h

neu310 - Psychophysics of Hearing

Module label	Psychophysics of Hearing
Modulkürzel	neu310
Credit points	12.0 KP
Workload	360 h (5 SWS Practical (PR) "Experiments in Hearing" Total workload 225h: 70h contact / 110h experimental work / 45h exam preparation 1 SWS Supervised excercise (UE) "Fundamentals in psychoacoustic data analysis" Total workload 45h: 15h contact / 30h practising data analysis (incl. SPSS) 2 SWS Seminar (SE) "Hearing" Total workload 90h: 30h contact / 60h background reading)
Verwendbarkeit des Moduls	• Master's Programme Biology (Master) > Background Modules • Master's Programme Biology (Master) > Background Modules • Master's Programme Neuroscience (Master) > Background Modules
Zuständige Personen	• Klump, Georg Martin (module responsibility) • Klump, Georg Martin (Prüfungsberechtigt) • Langemann, Ulrike (Prüfungsberechtigt) • Beutelmann, Rainer (Prüfungsberechtigt)
Prerequisites	
Skills to be acquired in this module	+ Neurosci. knowlg. ++ Expt. Methods + Social skills ++ Maths/Stats/Progr. + Data present./disc. + Scientific English Students will learn the basics about performing a psychoacoustic experiment. Based on an experiment in which they study their own hearing, they will learn how to conduct a behavioural study in hearing and analyze the data. In addition, they will be be provided with an overview of the mechanisms of auditory perception.
Module contents	The modul comprises (i) a seminar “Hearing” [2 SWS] (ii) an exercise "Fundamentals in psychoacoustic data analysis" [1 SWS], and a (iii) practical course [7 SWS] including aspects of planning and conducting psychoacoustic experiments.
Literaturempfehlungen	Plack, Christopher J. (2005) The sense of hearing. Mahwah, NJ [u.a.] : Erlbaum (sufficient number of copies available in the university library)
Links	
Language of instruction	English
Duration (semesters)	1 Semester
Module frequency	annually, summer term, second half
Module capacity	6 (in total with bio640)
Type of module	je nach Studiengang Pflicht oder Wahlpflicht
Module level	---

Examination	Prüfungszeiten	Type of examination
Final exam of module	end of summer term	70% report or oral exam, 30% presentation In addition, mandatory but ungraded: regular active participation

Form of instruction	Comment	SWS	Frequency	Workload of compulsory attendance
Exercises		1	SoSe	14
Seminar		2	SoSe	28
Practical training		5	SoSe	70
Lecture			SoSe	0
Präsenzzeit Modul insgesamt				112 h

neu320 - Introduction to Neurophysics

Module label	Introduction to Neurophysics
Modulkürzel	neu320
Credit points	6.0 KP
Workload	180 h (2 SWS Lecture total workload 90h: 28h contact / 62h background reading/exam preparation 2 SWS Supervised exercise total workload 90h: 28h contact / 62h self-conducted exercise work/literature reading)
Verwendbarkeit des Moduls	• Master's Programme Neuroscience (Master) > Background Modules
Zuständige Personen	• Anemüller, Jörn (module responsibility) • Anemüller, Jörn (Prüfungsberechtigt) • Dietz, Mathias (Prüfungsberechtigt)
Prerequisites	recommended in semester: 3 (with Matlab prereq.: 1)
Skills to be acquired in this module	++ Neurosci. knowlg. + Independent research + Scient. Literature ++ Interdiscipl. knowlg. ++ Maths/Stats/Progr. + Data present./disc. Students will learn to recognize the dynamics in neuronal networks as the result of an interplay of physical, chemical and biological processes. Overview over major physical measurement procedures for the quantification of structure and function in neuronal systems. Using the language of mathematics as a fundamental tool for the description of underlying biophysical processes with stochastics, linear algebra, differential equations. Information as represented on different length- and timescales: From microscopic processes to macroscopic functional models. Learning and adaptation as adjustment of a biophysical system to its environment.
Module contents	• Biophysics of synaptic and neuronal transmission • Single neuron models: Hodgkin Huxley model, integrate and fire model, firing rate model • Biophysics of sensory systems in the auditory, visual and mechano-sensory modality • Description of neuronal dynamics: Theory of dynamical systems, from microscopic to macroscopic activity - Principles of neuronal activity measurments: from single-cell recordings to EEG, MEG and fMRI • Functional description of small neuronal networks: Receptive fields and their description with linear and non-linear models - The neuronal code: Spikes, spike trains, population coding, time- vs. rate-code - Decoding neuronal activity and its applications • Simulation of artificial neural networks as a functional model, Hopfield network, Boltzmann machine, Perceptron and deep networks - Informationtheoretic approaches, stimulus statistics, entropy, mutual information • Learning and plasticity, conditioning and reinforcement learning, Hebbian learning, long-term potentiation and long-term depression
Literaturempfehlungen	• Chow, Gutkin, Hansel, Meunier, Dalibard (Eds.): Methods and Models in Neurophysics (2003) • Dayan, Abbott: Theoretical Neuroscience (2005) • Galizia, Lledo (Eds.): Neurosciences, from molecule to behauvior (2013) • Gerstner, Kistler, Naud, Paninski: Neuronal Dynamics - From single neurons to networks and models of Cognition (2014) • Rieke, Warland, de Ruyter van Steveninck, Bialek: Spikes - Exploring the neural code (1999) • Schnupp, Nelken, King: Auditory Neuroscience (2010)

Links	
Language of instruction	English
Duration (semesters)	1 Semester
Module frequency	winter term / annually
Module capacity	30 (Registration procedure / selection criteria: StudIP)
Reference text	Recommended in combination with: 5.04.4012 Informationsverarbeitung und Kommunikation (phy350) Will also be offered in "M.Sc. Physik, Technik, Medizin"

Examination	Prüfungszeiten	Type of examination
Final exam of module	end of winter term	80% oral exam or written exam, 20% exercise work and presentation

Form of instruction	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture			WiSe	0
Seminar			WiSe	0
Exercises			WiSe	0
Präsenzzeit Modul insgesamt				0 h

bio605 - Molecular Genetics and Cell Biology

Module label	Molecular Genetics and Cell Biology
Modulkürzel	bio605
Credit points	12.0 KP
Workload	360 h
Verwendbarkeit des Moduls	• Master's Programme Biology (Master) > Background Modules • Master's Programme Biology (Master) > Background Modules • Master's Programme Molecular Biomedicine (Master) > Background Modules • Master's Programme Neuroscience (Master) > Background Modules
Zuständige Personen	• Neidhardt, John (module responsibility) • Neidhardt, John (Prüfungsberechtigt) • Koch, Karl-Wilhelm (Prüfungsberechtigt) • Jüschke, Christoph (Prüfungsberechtigt)
Prerequisites	BSc (Biologie, Biochemie)
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 (E) (written and spoken) + teamwork + ethics and professional behaviour + project and time management Addressing students with an emphasis on molecular biology, molecular genetics, cell biology, and neurobiology
Module contents	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.
Literaturempfehlungen	Textbooks of Cell Biology
Links	http://www.uni-oldenburg.de/humangenetik/
Language of instruction	English
Duration (semesters)	1 Semester
Module frequency	winter term
Module capacity	15
Reference text	associated with bio900
Type of module	Wahlpflicht / Elective
Module level	MM (Mastermodul / Master module)
Teaching/Learning method	Lecture, seminar, exercise
Previous knowledge	Basic knowledge in cell biology, genetics, biochemistry

Examination	Prüfungszeiten	Type of examination
Final exam of module		written examination (70 %), paper(s) presentation 30 %; not graded: signed lab protocols, regular active participation is required for the module to be passed.

Form of instruction	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		2	WiSe	28
Seminar		1	WiSe	14
Exercises		5	WiSe	70
Präsenzzeit Modul insgesamt				112 h

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	• Master's Programme Biology (Master) > Background Modules • Master's Programme Biology (Master) > Background Modules • Master's Programme Molecular Biomedicine (Master) > Background Modules • Master's Programme Neuroscience (Master) > Background Modules
Zuständige Personen	• Koch, Karl-Wilhelm (module responsibility) • Koch, Karl-Wilhelm (Prüfungsberechtigt) • Scholten, Alexander (Prüfungsberechtigt) • Scholten, Alexander (Module counselling)
Prerequisites	none
Skills to be acquired in this module	++ deepened knowledge of biological working methods ++ methods: protein expression and purification, functional assays, enzyme kinetics, spectroscopic techniques ++ data analysis skills + interdisciplinary thinking ++ critical and analytical thinking + independent searching and knowledge of scientific literature + ability to perform independent biological research ++ data presentation and discussion in German and English (written and spoken) ++ teamwork + project and time management
Module contents	Lecture: Molecular fundamentals of cellular signal processes Seminar: Signal transduction Exercises: Experiments on cellular signal transduction and enzymology Mechanisms of biochemical signal transduction are imparted theoretically and experimentally
Literaturempfehlungen	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%), protocolls (50%) Prerequisite for passing the module is active participation: Presentation(s) in the seminar

Form of instruction	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		1	WiSe	14
Seminar		1	WiSe	14
Exercises		6	WiSe	84
Präsenzzeit Modul insgesamt				112 h

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	• Master's Programme Biology (Master) > Background Modules • Master's Programme Biology (Master) > Background Modules • Master's Programme Molecular Biomedicine (Master) > Background Modules • Master's Programme Neuroscience (Master) > Background Modules
Zuständige Personen	• Sienknecht, Ulrike (module responsibility) • Sienknecht, Ulrike (Module counselling) • Sienknecht, Ulrike (Prüfungsberechtigt) • Claußen, Maike (Prüfungsberechtigt)
Prerequisites	
Skills to be acquired in this module	Upon successful completion of this course, students • know the fundamental problems organisms share in development • know the common basic steps of ontogenesis after comparing the life cycles of different species (both vertebrates and invertebrates) • know the fundamentals of the genetic control of cell-fate specification, morphogenesis, and organogenesis • know the principles of gene regulatory networks in development and are able to explain examples • are able to explain and discuss mechanisms of development across taxonomic groups and questions about the evolution of developmental mechanisms • have in-depth knowledge of the development of animal nervous systems, including cellular and net-work properties skills: ++ deepened biological expertise + deepened knowledge of biological working methods ++ interdisciplinary thinking ++ critical and analytical thinking + independent searching and knowledge of scientific literature + ability to perform independent biological research + teamwork
Module contents	Lectures on the fundamentals and concepts of developmental biology, including evolutionary aspects. Parallel seminars matching the topics of the lectures and emphasizing discussion. Lecture topics: • Introduction to Developmental Biology • Cell-Cell Communication • Differential Gene Expression (I and II) • Early Development of Vertebrates, Gastrulation • Neurulation • Brain Development • Axonal Growth, Target Selection, Synaptogenesis and Refinement • Neural Crest • Mesoderm Development • Morphogenesis • Developmental Mechanisms of Evolutionary Change • Model Organisms in Developmental Biology • Transgenic Mice • Medical Implications of Developmental Biology

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)

Form of instruction	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		3	WiSe	45
Seminar		3	WiSe	45
Präsenzzeit Modul insgesamt				90 h

bio846 - Lab Exercises in Development and Evolution

Module label	Lab Exercises in Development and Evolution
Modulkürzel	bio846
Credit points	6.0 KP
Workload	180 h
Verwendbarkeit des Moduls	• Master's Programme Biology (Master) > Background Modules • Master's Programme Biology (Master) > Background Modules • Master's Programme Neuroscience (Master) > Background Modules
Zuständige Personen	• Sienknecht, Ulrike (module responsibility) • Sienknecht, Ulrike (Module counselling) • Sienknecht, Ulrike (Prüfungsberechtigt) • Claußen, Maike (Prüfungsberechtigt) • Ebbers, Lena (Prüfungsberechtigt)
Prerequisites	**mandatory** prerequisite is the module bio845 (neu110) (Introduction to Development and Evolution)
Skills to be acquired in this module	Upon successful completion of this course, students have skills in methods of developmental biology: • are capable of performing live embryo husbandry • are able to carry out in-ovo stainings • are familiar with the use of embryonic stage discrimination standards for model organisms • document the observed embryonic stages by drawings with anatomical labelling • are familiar with tissue preparation (including cryosectioning), the use of different molecular markers, and immunohistological staining methods • microscopy, data analysis, and photographic data documentation • know the standards of proper documentation of research data and the universal format of a lab notebook • know how to carry out formal laboratory reports (and the structure of a scientific paper) • have basic knowledge in the field of auditory system development • have basic knowledge of the organisation of the auditory system across vertebrate groups • have basic knowledge of the development of the middle and inner ear, as well as selected auditory brain centres are able to summarize current hypotheses about the evolution of the auditory system in vertebrates skills: ++ deepened biological expertise ++ deepened knowledge of biological working methods ++ data analysis skills ++ 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 + ethics and professional behaviour + project and time management
Module contents	Lab exercises in developmental biology of auditory research model organisms, such as chicken and mouse embryos. Practical introduction to methods, such as in-ovo live observation; developmental stage discrimination and description, tissue preparation for histology, sectioning, staining, and microscopy, including data analyses. Seminars in the field of auditory system development and methods based on current literature
Literaturempfehlungen	**textbooks:** Gilbert S.F., Development, Macmillan Publishers Ltd, 11th edition 2016; Mathews W.W & Schoenwolf G.C., Atlas of Descriptive Embryology, Prentice-Hall Inc., Simon & Schuster, 5th edition 1998; in addition, current research papers
Links	
Language of instruction	English
Duration (semesters)	1 Semester

Module frequency	winter term	
Module capacity	6 (selection criteria: advance of studies in MA program)	
Reference text	Associated with bio845 (neu110) (Introduction to Development and Evolution)	
Type of module	Wahlpflicht / Elective	
Module level	MM (Mastermodul / Master module)	
Teaching/Learning method	Exercise, lecture, seminar	
Previous knowledge	organismic biology, experience with lab work	
Examination	Prüfungszeiten	Type of examination
Final exam of module	same winter term	1 report

Form of instruction	Exercises
SWS	6
Frequency	WiSe

neu141 - Visual Neuroscience - Physiology and Anatomy

Module label	Visual Neuroscience - Physiology and Anatomy
Modulkürzel	neu141
Credit points	12.0 KP
Workload	360 h (3 SWS Lecture (VO) Total workload 90 h: 30h contact / 60h background literature reading and preparation for sh 1 SWS Seminar (SE) Total workload 30h: 10h contact / 20h literature reading and preparation of result presentation 8 SWS Supervised excercise (UE) Total workload 240h: 200h contact / 40h results analysis, writing of short reports for portfolio)
Verwendbarkeit des Moduls	• Master's Programme Biology (Master) > Background Modules • Master's Programme Biology (Master) > Background Modules • Master's Programme Molecular Biomedicine (Master) > Background Modules • Master's Programme Neuroscience (Master) > Background Modules
Zuständige Personen	• Greschner, Martin (module responsibility) • Greschner, Martin (Prüfungsberechtigt) • Ahlers, Malte (Prüfungsberechtigt) • Dedek, Karin (Prüfungsberechtigt) • Dömer, Patrick (Prüfungsberechtigt)
Prerequisites	Basic knowledge of neurobiology
Skills to be acquired in this module	++ Neurosci. knowlg. ++ Expt. Methods + Independent research ++ Scient. Literature + Social skills + Maths/Stats/Progr. ++ Data present./disc. + Scientific English + Ethics Upon successful completion of this course, students • have basic knowledge of electrophysiological techniques used in neuroscience research • have acquired first practical skills in some electrophysiological techniques • have acquired basic skills in data analysis • have knowledge on retinal physiology and anatomy of the visual system • have basic knowledge of brain structures and their function • have profound knowledge of the architecture and circuits of the vertebrate retina • have aquired basic skills in histological techniques (tissue fixation, embedding, sectioning, staining procedures, immunohistochemistry) • have aquired fundamental skills in microscopy (differential interference contrast microscopy, phase-contrast microscopy, confocal microscopy)
Module contents	The background module Neurophysiology consists of two weeks of theoretical introduction and two weeks of hands-on lab exercises in patch or extracellular recordings and two weeks of hands-on lab exercises in anatomy. The seminars cover the following topics: • Visual system • Introduction to electrophysiological methods • Introduction into methods used in neuranatomy and neurochemistry • Introduction into microscopy and image analysis • Presentation and discussion of results relating to the literature
Literaturempfehlungen	Course scripts and mandatory scientific literature discussed in the seminar will be available in Stud.IP.

	Background and seminar literature will be available in Stud.IP.
Links	
Language of instruction	English
Duration (semesters)	1 Semester
Module frequency	annually, summer term, first half (full time)
Module capacity	12 - with Visual Neuroscience: Anatomy (Shared course components with (cannot be credited twice): neu151 BM Visual Neuroscience: Anatomy)

Examination	Prüfungszeiten	Type of examination
Final exam of module	during the course (summer semester, first half) In addition, mandatory but ungraded: seminar presentation	PF

Form of instruction	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
Präsenzzeit Modul insgesamt				84 h

neu340 - Invertebrate Neuroscience - Neurophysiology

Module label	Invertebrate Neuroscience - Neurophysiology
Modulkürzel	neu340
Credit points	6.0 KP
Workload	180 h (2 SWS Seminar (SE) Total workload 72h: 28h contact / 44h background literature reading, preparation for short tests, portfolio assignments and results presentation 3 SWS Supervised exercise (UE) Total workload 108h: 42h contact / 66h data analysis and preparation of portfolio assignments))
Verwendbarkeit des Moduls	• Master's Programme Biology (Master) > Background Modules • Master's Programme Biology (Master) > Background Modules • Master's Programme Neuroscience (Master) > Background Modules
Zuständige Personen	• Kretzberg, Jutta (module responsibility) • Kretzberg, Jutta (Prüfungsberechtigt) • Albert, Jörg (Prüfungsberechtigt)
Prerequisites	attendance in pre-meeting
Skills to be acquired in this module	++ Neurosci. knowlg. ++ Expt. Methods + Scient. Literature + Social skills + Maths/Stats/Progr. + Independent Research + Data present./disc. + Scientific English + Ethics Upon successful completion of this course, students • have knowledge on invertebrate neuronal systems in comparison to vertebrate systems • have discussed an overview of experimental and theoretical methods of invertebrate neuroscienc • have acquired first practical skills in intracellular recordings from invertebrate neurons • have acquired basic skills in data analysis • have acquired an intuitive understanding of membrane potential and action potential generation based on computer simulations
Module contents	The module consists of three weeks of seminar and hands-on lab exercises on intracellular recordings from leech neurons, as well as computer simulations to study the basis of membrane potential and action potential generation. The seminar covers the following topics: • Invertebrate neuronal systems in comparison to vertebrate systems • Ion channels, membrane potential and action potential generation • Introduction to electrophysiological methods • Introduction to data analysis methods In the practical exercises, portfolio assignments will be performed on: • Qualitative electrophysiological classification of different cell types in the leech nervous system • Quantitative analysis (stimulus - response relationship) of at least one cell type • Action potential generation: Comparison of model simulations and experiments

- Planning a small individual team-work project based on the techniques taught in this module, that can be used as basis for the module neu345

Literaturempfehlungen	Course scripts and mandatory scientific literature (3 review articles) discussed in the seminar will be available in Stud.IP Background and seminar literature will be available in Stud.IP
Links	
Language of instruction	English
Duration (semesters)	1 Semester
Module frequency	annually, summer term, second half
Module capacity	12 (this module provides the background for neu345 "Neural Computation in invertebrate systems")
Type of module	Wahlpflicht / Elective
Previous knowledge	basic knowledge of neurobiology, basic MATLAB programming skills

Examination	Prüfungszeiten	Type of examination
Final exam of module	during the course (summer term, second half)	Portfolio consisting of short tests, short reports (according to portfolio assighnments) and seminar presentation

Form of instruction	Comment	SWS	Frequency	Workload of compulsory attendance
Seminar		2	SoSe	28
Exercises		3	SoSe	42
Präsenzzeit Modul insgesamt				70 h

neu345 - Neural Computation in Invertebrate Systems

Module label	Neural Computation in Invertebrate Systems
Modulkürzel	neu345
Credit points	6.0 KP
Workload	180 h (2 SWS Seminar Total workload 72 h: 28 h contact / 15 h background literature reading, 14 h online science communication workshop, 15 h preparation for the presentation of results as scientific poster 3 SWS Supervised exercise Total workload 108 h: 42 h contact / 66 h independent lab-work, self-organized team work, data analysis, and preparation of results figures and texts))
Verwendbarkeit des Moduls	• Master's Programme Neuroscience (Master) > Background Modules
Zuständige Personen	• Kretzberg, Jutta (module responsibility) • Kretzberg, Jutta (Prüfungsberechtigt) • Albert, Jörg (Prüfungsberechtigt) • Ashida, Go (Prüfungsberechtigt)
Prerequisites	
Skills to be acquired in this module	Upon successful completion of this course, students • have planned and conducted a small, self-defined and self-organized project in a team • have knowledge on an invertebrate neuronal system • have knowledge on neural coding and corresponding data analysis techniques • have acquired skills in data analysis and / or experimental techniques and / or modeling • are able to critically evaluate and discuss experimental results • have prepared and presented a scientific poster + Neurosci. knowlg. + Expt. Methods ++ Independent research + Scient. Literature ++ Social Skills + Maths/Stats/Progr. ++ Data present./disc. + Scientific English + Ethics
Module contents	This module builds up on the knowledge and methods acquired in the module neu340 Invertebrate Neuroscience. In the seminar, the knowledge on invertebrate systems and neural coding in general is deepened based on scientific literature. In the practical exercise of the module, students can choose one topic from a range of different research questions on computation in the leech nervous system (e.g. comparison of different cell types, electrical and chemical synaptic connections, exact measurement of spike threshold, phase locking). Small groups (2-3) of students plan, perform, and analyze experiments (intracellular

	recordings) or model simulations (model framework will be provided or can be self-written based on module neu241 computational neuroscience - Introduction) to tackle their topic. The portfolio consists of assignments covering the planning, analysis, interpretation, and presentation of the results with feedback given during the course on each project stage.
Literaturempfehlungen	Course scripts and background and seminar literature will be available in Stud.IP. Scientific literature discussed in the seminar depends on the project topics.
Links	
Language of instruction	English
Duration (semesters)	1 Semester
Module frequency	
Module capacity	12 (but only 6 for experimental projects)
Type of module	Wahlpflicht / Elective
Module level	MM (Mastermodul / Master module)
Previous knowledge	neu340 Invertebrate Neuroscience

Examination	Prüfungszeiten	Type of examination
Final exam of module	During the course (summer term, second half)	Portfolio constisting of project plan, scientific poster, poster presentation

Form of instruction	Comment	SWS	Frequency	Workload of compulsory attendance
Seminar		2	SoSe	28
Exercises		3	SoSe	42
Präsenzzeit Modul insgesamt				70 h

neu350 - Biological Foundations of Neuroscience

Module label	Biological Foundations of Neuroscience
Modulkürzel	neu350
Credit points	6.0 KP
Workload	180 h (Lecture Total workload 90 h: 28 h contact / 14 h tutorial / 48 h self-study and preparation for exam Seminar Total workload 90 h: 28 h contact / 62 h self-study and preparation for exam)
Verwendbarkeit des Moduls	• Master's Programme Neuroscience (Master) > Background Modules
Zuständige Personen	• Puller, Christian (module responsibility) • Koch, Karl-Wilhelm (Prüfungsberechtigt) • Neidhardt, John (Prüfungsberechtigt) • Hartmann, Anna-Maria (Prüfungsberechtigt) • Klump, Georg Martin (Prüfungsberechtigt) • Greschner, Martin (Prüfungsberechtigt) • Owczarek-Lipska, Marta (Prüfungsberechtigt)
Prerequisites	Recommended in combination with "Research Techniques in Neuroscience"
Skills to be acquired in this module	Upon successful completion of this course, students have acquired basic knowledge of fundamental principles of neurobiology. The aim of this background module is to provide a solid biological knowledge base required for studying advanced neuroscientific topics. It is designed in particular, but not exclusively, for students joining the local M.Sc. Neuroscience program from previous study paths with little (neuro)biological background. ++ Neurosci. knowlg. + Scient. Literature + Social skills + Interdiscipl. knowlg. + Scientific English
Module contents	The background module consists of a lecture series and an associated seminar. The following topics are covered: • Biochemistry • Genetics • Electrophysiology • Cell biology • Systems Neuroscience
Literaturempfehlungen	Neuroscience, newest edition; Purves; Sinauer Accociates Stryer Biochemistry and Alberts et al. Molecular Biology of the Cell, several editions Molecular Biology of the Gene, Watson (Pearson Verlag)
Links	
Language of instruction	English
Duration (semesters)	1 Semester
Module frequency	annually
Module capacity	unlimited

Examination	Prüfungszeiten	Type of examination
Final exam of module	at the end of the course	KL

Form of instruction	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		2	SoSe oder WiSe	28
Seminar		2	SoSe oder WiSe	28
Präsenzzeit Modul insgesamt				56 h

neu360 - Auditory Neuroscience

Module label	Auditory Neuroscience
Modulkürzel	neu360
Credit points	6.0 KP
Workload	180 h (1 SWS Lecture (VO) Total workload 45h: 14 h contact / 31 h background reading 1 SWS Seminar (SE) Total workload 45h: 14 h contact / 15 h background reading / 16 h preparation and presentation 2 SWS Supervised excercise (UE) Total workload 90h: 10 h contact / 20 h literature search / 60 h work on essay paper)
Verwendbarkeit des Moduls	• Master's Programme Biology (Master) > Background Modules • Master's Programme Biology (Master) > Background Modules • Master's Programme Neuroscience (Master) > Background Modules
Zuständige Personen	• Köppl, Christine (module responsibility) • Klump, Georg Martin (Prüfungsberechtigt) • Köppl, Christine (Prüfungsberechtigt)
Prerequisites	Recommended previous knowledge/skills: Basics of Neurosensory Science and Behavioural Biology
Skills to be acquired in this module	++ Neurosci. knowlg + Expt. methods ++ Scient. Literature + Social skills ++ Interdiscipl. knowlg ++ Data present./disc. ++ Scientific English + Ethics Introduction to Auditory Physiology. May serve as preparation for a Research Module in this area. Upon successful completion of this course, students • have profound knowledge on auditory sensory processing at several levels (including cochlear transduction mechanisms, central auditory processing) • have basic knowledge of the large range of techniques used in auditory research • are able to read and critically report to others on an original research paper in auditory neuroscience • are able to research and review a specific topic in auditory neuroscience
Module contents	One week introductory block course, comprised of a lecture series and matching seminar that emphasizes discussion. Topics: Hair cells: structure, transduction mechanism, receptor potential, synaptic transmission Basilar papilla / cochlea: structure, micromechanics, amplification; otoacoustic emissions Auditory nerve: phase locking, rate coding. Excitation patterns Ascending auditory pathways: wiring, principles of excitation/inhibition, examples of cellular/molecular specialisations Sound localisation in birds and mammals Central auditory processing: imaging techniques, auditory streams, cortex, primates Relation between psychophysics and neurophysiology The introductory block is followed by a supervised literature search and individually written term paper on a specific topic in auditory neuroscience.
Literaturempfehlungen	About 20 selected original papers (selection varies) Pickles JO (2012) An Introduction to the Physiology of Hearing. Brill, Netherlands

Links	
Language of instruction	English
Duration (semesters)	1 Semester
Module frequency	annually, summer term, second half
Module capacity	15 (BM neu211 "Neurosensory Science and Behaviour" or BM neu270 "Neurocognition and Psychophysics" or skills module biox "Current Topics in Hearing Science")
Reference text	Registration procedure / selection criteria: StudIP, final acceptance after assignment of seminar presentation

Examination	Prüfungszeiten	Type of examination
Final exam of module	within a few weeks of the end of summer term lecture period	HA

Form of instruction	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		1	SoSe	14
Seminar		1	SoSe	14
Exercises		2	SoSe	28
Präsenzzeit Modul insgesamt				56 h

neu370 - Neuroprosthetics

Module label	Neuroprosthetics
Modulkürzel	neu370
Credit points	6.0 KP
Workload	180 h (2 SWS Lecture (total workload 90h: 30h contact/ 60 h 60h individual revision of lecture contents, test preparation) 1 SWS Seminar (total workload 45h: 15h contact / 30 h individual reading and preparation) 1 SWS Supervised Exercise (total workload 45h: 15h contact / 30 h individual work on portfolio tasks (interpretation of simulation results)))
Verwendbarkeit des Moduls	• Master's Programme Neuroscience (Master) > Background Modules
Zuständige Personen	• Dietz, Mathias (Prüfungsberechtigt) • Dietz, Mathias (module responsibility)
Further responsible persons	Anna Dietze
Prerequisites	Either Neurophysics (5.04.4211) or Computational Neuroscience
Skills to be acquired in this module	+ Neurosci. knowlg. + Expt. Methods + Scient. Literature + Social skills + Interdiscipl. knowlg. + Maths/Stats/Progr. + Data present./disc. + Ethics [/nop] Upon successful completion of this course, students - understand how neuroprostheses work - have an interdisciplinary understanding of the underlying principles of electrical stimulation of neurons - can implement a coding strategy for neuroprostheses - knows how a cochlear implant operates in detail and why it operates this way.
Module contents	Topics - electrical field distribution - electrical stimulation of neurons - biocompatibility - coding strategies - cochlear implants - student seminar presentations on various types of neuroprothetics
Literaturempfehlungen	Scientific articles: Copies of scientific articles for the seminar will be provided prior to the course Text books or papers will be suggested prior to the course.
Links	
Languages of instruction	
Duration (semesters)	1 Semester
Module frequency	annually (summer term)
Module capacity	20

Examination	Prüfungszeiten	Type of examination
Final exam of module		PF

Form of instruction	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
Präsenzzeit Modul insgesamt				84 h

psy270 - Functional MRI Data Analysis

Module label	Functional MRI Data Analysis
Modulkürzel	psy270
Credit points	9.0 KP
Workload	270 h
Verwendbarkeit des Moduls	• Master's Programme Biology (Master) > Background Modules • Master's Programme Neurocognitive Psychology (Master) > Mastermodule • Master's Programme Neuroscience (Master) > Background Modules
Zuständige Personen	• Gießing, Carsten (module responsibility) • Gießing, Carsten (Prüfungsberechtigt)
Prerequisites	Enrolment in Master's programme Neurocognitive Psychology, Neuroscience, or Biology.
Skills to be acquired in this module	**Goals of module:** Students will learn the basics about planning and performing a neuroimaging study. They will focus on the statistical and methodological background of functional neuroimaging data analysis and analyse a sample functional MRI data set. **Competencies:** ++ experimental methods ++ statistics & scientific programming + data presentation & discussion ++ group work
Module contents	**Theoretical knowledge on functional MRI data analysis** **Planning, performance and analysis of functional neuroimaging studies using** **MATLAB-based software** **Hands-on fMRI data analysis with SPM**
Literaturempfehlungen	• Frackowiak RSJ, Friston KJ, Frith C, Dolan R, Price CJ, Zeki S, Ashburner J, and Penny WD (2003). Human Brain Function. Academic Press, 2nd edition. San Diego, USA. • Huettel, SA, Song, AW, & McCarthy, G (2009). Functional Magnetic Resonance Imaging (2nd Edition). Sinauer Associates. Sunderland, MA, USA. • Poldrack RA, Mumford JA, & Nichols TE (2011). Handbook of Functional MRI Data Analysis. Cambridge University Press. New York, USA.
Links	
Language of instruction	English
Duration (semesters)	1 Semester
Module frequency	The module will be offered every summer term.
Module capacity	15 (The remaining places are reserved for Biology and Neuroscience students.)
Reference text	Since the module is primarily offered for the Master's programme Biology it has to be offered as a blocked course. Please contact us if you are interested in the module but have problems with interfering other courses. PLEASE NOTE: We strongly recommend to take either psy170, psy270, psy280, or psy220 to gain

	methodological competencies (EEG, fMRI, TBS, HCI) that are needed for most practical projects and Master's theses!
Type of module	Wahlpflicht / Elective
Module level	MM (Mastermodul / Master module)
Teaching/Learning method	blocked course with lecture, interactive seminar and exercise parts
Previous knowledge	Students need to have solid statistical knowledge as taught in the Introductory Course Statistics and in Research Methods.

Examination	Prüfungszeiten	Type of examination
Final exam of module	middle of summer term	Oral or written examination Required active participation for gaining credits: 1-2 presentations participation in discussions on other presentations attendance of at least 70% in the seminars and exercises within one semester (will be checked in StudIP).

Form of instruction	Seminar
SWS	1
Frequency	SoSe

Research Modules

neu610 - External Research Project

Module label	External Research Project
Modulkürzel	neu610
Credit points	15.0 KP
Workload	450 h (240 h contact or individual lab work / 30 h data analysis / 40 h background reading / 50 h participation in seminar of host group and preparation of presentation/ 60 h preparation of written internship report / 30 science communication workshop with poster preparation and presentation))
Verwendbarkeit des Moduls	• Master's Programme Neuroscience (Master) > Research Modules
Zuständige Personen	• Köppl, Christine (module responsibility) • der Neuroscience, Lehrende (Prüfungsberechtigt)
Further responsible persons	all MSc Neuroscience teachers, see list of examiners
Prerequisites	A learning agreement signed by the student, the supervisor at the host institution, and the Oldenburg supervisor (from the list of examiners), needs to be submitted to the examination office prior to the start of lab work. Module can be taken multiple times (see list of choices for each semester), however, examination of individual projects by the same supervisor is limited to EITHER two research projects (neu600 and / or neu610), OR one research project (neu600 or neu610) and the master thesis (first or second supervisor)
Skills to be acquired in this module	+ Neurosci. knowlg. ++ Expt. methods ++ Independent research ++ Scient. literature ++ Social skills + Interdiscipl. knowlg. ++ Data present./disc. + Scientific English + Ethics Students are introduced to independent research in a specific area of neuroscience by a scientifically working group outside of the regular MSc Neuroscience faculty at the University of Oldenburg (usually a university, research institute, clinics or scientifically working company in Germany or abroad) Students perform individual research projects to learn: • planning and organization of a research project in a group outside of University of Oldenburg • formulate a scientific hypothesis • planning, performing and analyzing experiments and / or simulations • working with scientific background literature on the specific context of the project • oral presentation and discussion of backgrounds and results in the lab seminar • write a scientific report • prepare and present a scientific poster

Module contents

The External Research Module is carried out under the guidance and supervision of an experienced researcher who is not part of the regular Neuroscience faculty at the University of Oldenburg. It comprises approximately 7 (minimum 5) weeks of experimental or theoretical work, individually or in small groups, and, usually, participation in a regular group seminar during that time.

After completion of the lab work, students will continue to be advised during the writing phase of the project report by the external supervisor and / or by a local Neuroscience faculty member.

The timing of projects is by individual arrangement with the supervisor.

Participation in the Stud.IP workshop on science communication (https://elearning.uni-oldenburg.de/dispatch.php/course/overview?cid=6fc0dbbfa53d7b3f5e3680f52ac7d0f7) and a poster presentation at the biology & neuroscience student poster symposium is not mandatory but highly recommended.

Literaturempfehlungen	Provided by external and / or local supervisor, depending on the project
Links	
Language of instruction	English
Duration (semesters)	1 Semester
Module frequency	every semester
Module capacity	unlimited (Module can be taken multiple times (see list of choices for each semester), however, examination of individual projects by the same supervisor is limited to EITHER two research projects (neu600 and / or neu610), OR one research project (neu600 or neu610) and the master thesis (first or second supervisor))
Reference text	All teachers from the list of MSc Neuroscience examiners at the University of Oldenburg can act as examiners, students should contact appropriate supervisors individually Prior to project start, external and local supervisors must fill the learning agreement form. The supervisor at the host institution is invited to submit a short, written statement of assessment, final grading is done by the supervisor from the list of examiners.
Type of module	Wahlpflicht / Elective
Module level	MM (Mastermodul / Master module)

Examination	Prüfungszeiten	Type of examination
Final exam of module	within 2 months after conclusion of lab work	internship report

Form of instruction	Projektorientiertes Modul
SWS	10
Frequency	SoSe und WiSe

neu600 - Neuroscience Research Project

Module label	Neuroscience Research Project
Modulkürzel	neu600
Credit points	15.0 KP
Workload	450 h (2 SWS Seminar (SE) 28 h contact / 62 h reading and presentation preparation 8 SWS Research Internship (IFP) 120 h contact / 120 h independent lab work / 30 h data analysis / 60 h preparation of written internship report / 30 h science communication workshop with poster preparation and presentation))
Verwendbarkeit des Moduls	• Master's Programme Neuroscience (Master) > Research Modules
Zuständige Personen	• Kretzberg, Jutta (module responsibility) • der Neuroscience, Lehrende (Prüfungsberechtigt) • Bräuer, Anja (Prüfungsberechtigt) • Debener, Stefan (Prüfungsberechtigt) • Herrmann, Christoph Siegfried (Prüfungsberechtigt) • Kranczioch-Debener, Cornelia (Prüfungsberechtigt) • Özyurt, Jale Nur (Prüfungsberechtigt) • Puschmann, Sebastian (Prüfungsberechtigt) • Milenkovic, Ivan (Prüfungsberechtigt) • Sörös, Peter (Prüfungsberechtigt) • Lücke, Jörg (Prüfungsberechtigt) • Ruigendijk, Esther (Prüfungsberechtigt)
Further responsible persons	all MSc Neuroscience teachers, see list of examinors
Prerequisites	Depending on project choice, please check Stud.IP and ask the supervisor. Module can be taken multiple times, however, supervision of individual projects is limited to 45 ECTS for the same combination of student and supervisor (1 research module + Master thesis OR up to 3 research modules, including external research projects)
Skills to be acquired in this module	+ Neurosci. knowlg. ++ Expt. Methods ++ Independent research ++ Scient. Literature + Social skills + Interdiscipl. knowlg. + Maths/Stats/Progr. + Data present./disc. + Scientific English + Ethics Students perform individual research projects to learn: • planning and organization of a research project in a group outside of University of • Oldenburg • formulate a scientific hypothesis • planning, performing and analyzing experiments and / or simulations • working with scientific background literature on the specific context of the project • oral presentation and discussion of backgrounds and results in the lab seminar

- write a scientific report
- prepare and present a scientific poster

Module may serve as preparation for a Master's thesis.

Module contents

The Research Module is carried out under the guidance and supervision of a member of the Neuroscience faculty at the University of Oldenburg (see list of examiners). It comprises approximately 7 (minimum 5) weeks of experimental or theoretical work, individually or in small groups, and a regular seminar for training, reporting and feedback advice during that time. Students can choose between many options of individual projects, offered by the different groups involved in the MSc Neuroscience study program.

Research questions, methods and approaches differ between individual projects. Please refer to the list of options in Stud.IP and contact potential supervisors directly.

The timing of projects is by individual arrangement with the supervisor. Many, but not all, project options can also be scheduled during semester breaks, and / or as part-time options (lasting more than 7 weeks).

Note that, for some options, priority for admission to the project is given to students who passed a background module offered by the supervisor

Participation in the Stud.IP workshop on science communication (https://elearning.uni-oldenburg.de/dispatch.php/course/overview?cid=6fc0dbbfa53d7b3f5e3680f52ac7d0f7) and a poster presentation at the biology & neuroscience student poster symposium is not mandatory but highly recommended.

Literaturempfehlungen	Provided by the supervisor, depending on the project.
Links	
Languages of instruction	
Duration (semesters)	1 Semester
Module frequency	every semester
Module capacity	unlimited (no restriction)
Type of module	Wahlpflicht / Elective
Module level	MM (Mastermodul / Master module)
Previous knowledge	Depending on selected option - please contact the supervisor

Examination	Prüfungszeiten	Type of examination
Final exam of module	- within 2 months after conclusion of lab work - in addition, mandatory but ungraded: presentation at lab seminar	PR

Form of instruction	Comment	SWS	Frequency	Workload of compulsory attendance
Project practical training		8	SoSe oder WiSe	112
Seminar		2	SoSe oder WiSe	28
Präsenzzeit Modul insgesamt				140 h

Skills Modules

neu710 - Neuroscientific Data Analysis in Matlab

Module label	Neuroscientific Data Analysis in Matlab
Modulkürzel	neu710
Credit points	6.0 KP
Workload	180 h (180 h 2 SWS Lecture (VL) and Seminar (SE) Total workload 90 h: 28 h contact / 62 h individual preparation and working on assignments 2 SWS Supervised exercise (UE) Total workload 90 h: 28 h contact / 62 h individual preparation and working on assignments)
Verwendbarkeit des Moduls	• Master's Programme Neuroscience (Master) > Skills Modules
Zuständige Personen	• Kretzberg, Jutta (module responsibility) • Kretzberg, Jutta (Prüfungsberechtigt)
Prerequisites	
Skills to be acquired in this module	+ Neurosci. knowlg. + Social skills + Interdiscipl. knowlg. ++ Maths/Stats/Progr. + Scientific English +Ethics Upon successful completion of this course, students • understand basic programming concepts. • have good knowledge about the most important aspects of the programming language Matlab and are able to write their own programs. • have basic knowledge in statistical testing. • have developed and applied a programs for the analysis of electrophysiological data. • have practiced the interpretation of data analysis results in a neuroscience context
Module contents	In each of the seven weeks, one or two specific topics are introduced in the lecture, practiced in the exercises and applied to electrophysiological data in a programming task: Matlab basics: Matlab windows, work space, vectors & matrices, saving & loading, graphics, scripts, functions • Data types: numbers, logicals, text, categorical • Control flow: if statements, loops (for, while) • Software development: Flow charts, testing, debugging • Working with data: Searching & sorting, logical indexing • Advanced data types: sparse matrices, 3D matrices, cell arrays, structures, tables • Statistics: random numbers, probability distributions, descriptive statistics, inferential statistics • Application data analysis: Implementation of spike train analysis methods and graphics, function handles • Application Modelling: curve fitting, simulation of time series With completing the seven tasks, each participant develops a toolbox of the

most common analysis methods for electrophysiological (spike and continuous) data. In addition to writing and commenting code, the programs are applied to experimental data. The tasks include questions about the interpretation of these analysis results.

Hence, the goal of this module is two-fold: Learning the programming language Matlab and analysis methods for electrophysiological data.

Literaturempfehlungen	Pascal Wallisch: MATLAB for Neuroscientists, Elsevier, Oxford
Links	
Language of instruction	English
Duration (semesters)	1 Semester
Module frequency	annually, winter term
Module capacity	24
Type of module	Wahlpflicht / Elective
Module level	MM (Mastermodul / Master module)
Previous knowledge	basic knowledge of math and statistics

Examination	Prüfungszeiten	Type of examination
Final exam of module	during the course	practical exercise - hand in code and interpretation each week

Form of instruction	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		1		14
Exercises		2		28
Seminar		1		14
Präsenzzeit Modul insgesamt				56 h

neu730 - Biosciences in the Public Eye and in our Laws

Module label	Biosciences in the Public Eye and in our Laws
Modulkürzel	neu730
Credit points	6.0 KP
Workload	180 h (56h contact / 84h research for presentations / 40h term paper)
Verwendbarkeit des Moduls	• Master's Programme Biology (Master) > Skills Modules • Master's Programme Biology (Master) > Skills Modules • Master's Programme Neuroscience (Master) > Skills Modules
Zuständige Personen	• Köppl, Christine (module responsibility) • Sienknecht, Ulrike (Module counselling) • Köppl, Christine (Prüfungsberechtigt) • Sienknecht, Ulrike (Prüfungsberechtigt)
Prerequisites	
Skills to be acquired in this module	+ Expt. methods + Scient. Literature ++ Social skills ++ Interdiscipl. knowlg + Data present./disc. + Scientific English ++ Ethics Upon completion of this course, students • know basic rules of good scientific practise • are aware of the legal framework that is relevant to biological research, e.g. on animal welfare or genetically modified organisms • have practised to research and summarize different viewpoints on biological research, using both scientific (peer-reviewed) and non-scientific sources • are able to identify and critically discuss ethical conflicts in biological research, e.g., in the context of stem cell research or data manipulation • are able to prepare and give a coherent presentation in a team • have practised to lead a group discussion
Module contents	In supervised exercises, students research the ethical aspects and controversial issues on several specific topics in the biosciences. Everyone participates in researching all topics. Students then take turns in summarizing and presenting each topic in small teams, and leading a critical discussion of each topic. Problem-based, independent research of the scientific background by the students is an integral part of this module. Example topics: Good scientific practise and fraud Neuroenhancement Artificial intelligence Animal welfare, Animal experiments Overfishing, Nature conservation State-of-the-art genetic tools and their implications Genetically modified organisms, e.g., in food production, chimeras Stem cells Humans as experimental subjects A bonus can be obtained through active participation during the semester. Active participation requires regular oral contributions to the group discussions, that go beyond giving your own talks. A bonus improves the exam mark by one step (0.3 or 0.4). The bonus is optional, an exam mark of 1.0 is achievable without a bonus. A bonus cannot be applied to pass a failed exam.
Literaturempfehlungen	
Links	
Language of instruction	English
Duration (semesters)	1 Semester
Module frequency	annually, summer term
Module capacity	18

Type of module		Wahlpflicht / Elective
Module level		MM (Mastermodul / Master module)
Previous knowledge		Fundamentals of genetics, physiology, ecology and biological systematics
Examination	Prüfungszeiten	Type of examination
Final exam of module	within a few weeks of summer term lecture period	Term paper Regular participation during the semester is required (max 3 days of absence)

Form of instruction	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture			SoSe	0
Seminar und Übung		4	SoSe	56
Präsenzzeit Modul insgesamt				56 h

neu760 - Scientific English

Module label	Scientific English
Modulkürzel	neu760
Credit points	6.0 KP
Workload	180 h (0,5 SWS Lecture (VO) Total workload 23h: 8h contact / 15h research for term paper 3,5 SWS Supervised exercise (UE) Total workload 158h: 46h contact / 46h preparation of texts and presentations / 66h term paper)
Verwendbarkeit des Moduls	• Master's Programme Biology (Master) > Skills Modules • Master's Programme Biology (Master) > Skills Modules • Master's Programme Molecular Biomedicine (Master) > Skills Modules • Master's Programme Neuroscience (Master) > Skills Modules
Zuständige Personen	• Köppl, Christine (module responsibility) • Köppl, Christine (Prüfungsberechtigt)
Prerequisites	non-native speakers
Skills to be acquired in this module	+ Neurosci. knowlg. ++ Social skills ++ Data present./disc. ++ Scientific English Upon completion of this course, students • have increased their proficiency in different forms of scientific presentation and communication in English, with special emphasis on neuroscience • are able to express themselves with correct sentence structure and grammar, correct use of idioms and correct pronounciation • are proficient in different contexts of scientific communication (e.g., paper, poster and informal exchange by email or phone) • are able to recognize and avoid common errors of non-native speakers.
Module contents	Lectures cover - characteristics of the different forms of scientific presentations - sentence structure using the passive voice - scientific vocabulary and terminology as contrasted to common speech - appropriate language for communication with scientific editors and referees Students read neuroscience texts of an advanced level and practice explaining and presenting these in both written and oral form. They also practice different contexts of scientific communication (e.g., paper, poster and informal exchange by email or phone). Emphasis is placed on individual problems in pronounciation and language use errors.
Literaturempfehlungen	http://users.wpi.edu/~nab/sci_eng/ScientificEnglish.pdf
Links	
Language of instruction	English
Duration (semesters)	1 Semester
Module frequency	annually, semester break
Module capacity	12
Reference text	Usually held in the break before summer term Outsourced to STELS-OL (Scientific and Technical English Language Service); native English speaker with in-depth neuroscience knowlg.
Previous knowledge	minimum English level B2 (C1 preferred) according to Common European Framework of Reference for Languages (CEFR) priority to non-native speakers, higher semester

Examination	Prüfungszeiten	Type of examination
Final exam of module	within 2 months of completing the course	Portfolio: 70% several quick tests, texts, presentations, 30% term paper Bonus system for active participation

Form of instruction	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		0.5	WiSe	7
Exercises		3.5	WiSe	49
Präsenzzeit Modul insgesamt				56 h

neu780 - Biological Data Analysis with Python

Module label	Biological Data Analysis with Python
Modulkürzel	neu780
Credit points	6.0 KP
Workload	180 h (2 SWS Lecture total workload 90h: 30h contact / 60h individual reading 2 SWS Supervised exercise total workload 90h: 45h contact / 45h solving programming exercises)
Verwendbarkeit des Moduls	• Master's Programme Biology (Master) > Skills Modules • Master's Programme Biology (Master) > Skills Modules • Master's Programme Neuroscience (Master) > Skills Modules
Zuständige Personen	• Winklhofer, Michael (module responsibility) • Winklhofer, Michael (Prüfungsberechtigt)
Prerequisites	
Skills to be acquired in this module	+ Neurosci. knowlg. ++ Maths/Stats/Progr. + Data present./disc. The ojective of the module is the acquistion of programming skills with focus on analysis of neurobiological datasets, using the programming language python. Python is available for any computer platform (PC, Mac, Linux) and is open source (for free), see https://www.python.org/. Students will learn how to write effective scripts for data processing and visualisation, making use of pre-existing program libraries for various generic purposes (maths, statistics, plotting, image analysis). Typical applications will be analysis of time series (e.g., electrophysiological recordings, movement data), images (e.g. immunohistochemical images, MRI slices), and spatio-temporal correlations in volume data. Students will also learn how to produce synthetica data from various noise models to assess signal-to-noise ratio in instrumental datasets.
Module contents	Data types and data structures, control structures, functions, modules, file input/output Standard libraries and SciPy libraries (Matplotlib, NumPy,...), scikit-image, VPython, ...
Literaturempfehlungen	open access http://www.swaroopch.com/notes/python/ http://docs.python.org/3/tutorial/index.html
Links	
Language of instruction	English
Duration (semesters)	1 Semester
Module frequency	semester break, annually
Module capacity	20
Reference text	Shared course components with (cannot be credited twice): pb328 "Einführung in Datenanalyse mit Python" (Professionalisierungsmodul im Bachelorstudiengang Biologie)

Examination	Prüfungszeiten	Type of examination
Final exam of module	term break, immediately after the course (2 weeks in February)	assignment of programming exercises, 4 out of 5 exercises to be assessed

Form of instruction	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		2	WiSe	28
Exercises		2	WiSe	28
Präsenzzeit Modul insgesamt				56 h

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 stuying 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	• Master's Programme Biology (Master) > Skills Modules • Master's Programme Biology (Master) > Skills Modules • Master's Programme Molecular Biomedicine (Master) > Skills Modules • Master's Programme Neuroscience (Master) > Skills Modules
Zuständige Personen	• Köppl, Christine (module responsibility) • Köppl, Christine (Prüfungsberechtigt) • Langemann, Ulrike (Prüfungsberechtigt) • Nolte, Arne (Prüfungsberechtigt) • Heyers, Dominik (Prüfungsberechtigt) • Ebbers, Lena (Prüfungsberechtigt) • Dedek, Karin (Prüfungsberechtigt) • Schmaljohann, Heiko (Prüfungsberechtigt) • Winklhofer, Michael (Prüfungsberechtigt)
Prerequisites	none
Skills to be acquired in this module	++ Expt. Methods + Independent Research + Scient. Literature ++ Social skills ++ Interdiscipl. knowlg + Scientific English ++ Ethics Upon successful completion of this course, students • 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. NOTE: These objectives aim to satisfy the requirements for EU directive A „Persons carrying out animal experiments“ and EU directive D „Persons killing animals”.
Module contents	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: • Legislation, ethics and the 3Rs • Scientific integrity • Data collection " • Basic biology of rodents, birds and fish • Husbandry, and nutrition of rodents, birds and fish • Animal Welfare • Health monitoring • Pain and distress • Euthanasia

Practical procedures will first be demonstrated, important aspects will then be practiced under supervision by every partipant, 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

Literaturempfehlungen	"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

Form of instruction	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		1	SoSe und WiSe	14
Exercises		1	SoSe und WiSe	14
Präsenzzeit Modul insgesamt				28 h

neu790 - Communicating Neuroscience

Module label	Communicating Neuroscience
Modulkürzel	neu790
Credit points	3.0 KP
Workload	90 h (90 h (28 h contact / 62 h individual reading and preparing discussion questions))
Verwendbarkeit des Moduls	• Master's Programme Biology (Master) > Skills Modules • Master's Programme Biology (Master) > Skills Modules • Master's Programme Neuroscience (Master) > Skills Modules
Zuständige Personen	• Kretzberg, Jutta (module responsibility) • Kretzberg, Jutta (Prüfungsberechtigt) • Köppl, Christine (Prüfungsberechtigt)
Prerequisites	
Skills to be acquired in this module	+ Neurosci. knowlg. ++ Scient. Literature ++ Social skills + Interdiscipl. knowlg. ++ Data present./disc. + Scientific English ++ Ethics Upon successful completion of this course, students will have thought about and discussed in depth scientific, social and ethical aspects of communication in and about neuroscience. In particular, participants practice critical reading of neuroscience literature, learn about the scientific publication process and discuss science communication to the general public.
Module contents	The overall goal of critical discussion of neuroscientific results in a scientific, social and ethical context requires preparation and active participation both before (Stud.IP wiki) and during the weekly sessions. Each participant is responsible for the preparation and moderation of at least one session in a group of 2-3 students. For passing the module, additional active participation is required in at least 10 of the seminar sessions. The specific papers and topics that are discussed vary, but typically cover: • How to find literature? • How to read different types of scientific papers: Classic papers, review papers, perspective papers, recent original papers? • Publication process, Authorship and impact metrics • Alternative publication paths and data sharing in neuroscience • Science communication for the general public and on social media • Face-to-face scientific communication
Literaturempfehlungen	List of published papers, as well as online resources for preparation will be selected by the teachers and participants and announced via Stud.IP. Background neuroscience textbooks, e.g.: Galizia, Lledo ‘Neuroscience – From Molecule to Behavior’, 2013, Springer Nicholls et al. ‘From Neuron to Brain’, 5th edition 2012, Sinauer Kandel et al. 'Principles of Neural Science', 5th Edition 2013, McGraw-Hill Comp.

Links

Related content: Science communication workshop:

https://elearning.uni-oldenburg.de/dispatch.php/course/overview?cid=6fc0dbbfa53d7b3f5e3680f52ac7d0f7

Language of instruction	English
Duration (semesters)	1 Semester
Module frequency	winter semester
Module capacity	20 (Registration procedure / selection criteria: StudIP)
Type of module	Wahlpflicht / Elective
Module level	MM (Mastermodul / Master module)

Examination	Prüfungszeiten	Type of examination
Final exam of module		Presentation (ungraded, pass / fail)

Form of instruction	Seminar
SWS	2
Frequency	WiSe

neu800 - Introduction to Matlab

Module label	Introduction to Matlab
Modulkürzel	neu800
Credit points	3.0 KP
Workload	90 h (2 SWS Supervised exercise (UE) "Introduction to MATLAB" Total workload 90h: 28h contact / 62h practising learned programming skills)
Verwendbarkeit des Moduls	• Master's Programme Biology (Master) > Skills Modules • Master's Programme Biology (Master) > Skills Modules • Master's Programme Neuroscience (Master) > Skills Modules
Zuständige Personen	• Gießing, Carsten (module responsibility) • Gießing, Carsten (Prüfungsberechtigt)
Prerequisites	
Skills to be acquired in this module	++ Expt. Methods + Social skills + Interdiscipl. knowlg. ++ Maths/Stats/Progr. + Data present./disc. + Scientific English Within this introductory course students will learn the basics of MATLAB programming. Participants will be introduced in fundamental programming concepts.
Module contents	The modul comprises an introduction to data structures, flow control, loops, graphics, basic data analyses with MATLAB, scripts and functions.
Literaturempfehlungen	Recommended: Wallisch, Pascal (2014) MATLAB for neuroscientists: an introduction to scientific computing in MATLAB. 2. ed., Amsterdam: Elsevier.
Links	
Language of instruction	English
Duration (semesters)	1 Semester
Module frequency	annually, summer term, second half
Module capacity	12 (in total with bio640) (shared course components with (cannot be credited twice): bio640)

Examination	Prüfungszeiten	Type of examination
Final exam of module	end of summer term	Working on exercises Regular active participation

Form of instruction	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture			SoSe	0
Seminar			SoSe	0
Exercises		2	SoSe	28
Präsenzzeit Modul insgesamt				28 h

neu810 - International Meeting Contribution

Module label	International Meeting Contribution
Modulkürzel	neu810
Credit points	3.0 KP
Workload	90 h
Verwendbarkeit des Moduls	• Master's Programme Biology (Master) > Skills Modules • Master's Programme Biology (Master) > Skills Modules • Master's Programme Neuroscience (Master) > Skills Modules
Zuständige Personen	• Kretzberg, Jutta (module responsibility) • Kretzberg, Jutta (Prüfungsberechtigt) • Köppl, Christine (Prüfungsberechtigt)
Prerequisites	
Skills to be acquired in this module	+ Neurosci. knowlg. ++ Independent research + Scient. Literature ++ Social skills + Interdiscipl. knowlg. ++ Data present./disc. + Scientific English + Ethics Preparation, presentation and critical discussion of own studies for an international audience: • participate in an international meeting • prepare a poster or talk for an international meeting • present own results in a way that is appropriate for the target audience • put own studies into the context of scientific literature • acquire additional knowledge about a broader field of research
Module contents	Active participation in a scientific conference, workshop, summer school etc, lasting a minimum of 3 full days. Student must be the presenter (poster or talk) and an author of the presented work, typically carried out in the context of a research module or the Master thesis. It is mandatory to present the poster or talk to Christine Köppl or Jutta Kretzberg prior to the meeting and incorporate the feedback on the presentation.
Literaturempfehlungen	dependent on the scientific topic
Links	
Language of instruction	English
Duration (semesters)	1 Semester
Module frequency	every semester, flexible
Module capacity	unlimited (please contact module organizer individually)
Type of module	Wahlpflicht / Elective
Module level	MM (Mastermodul / Master module)

Examination	Prüfungszeiten	Type of examination
Final exam of module		presentation (ungraded, pass/fail)

Form of instruction	Seminar
SWS	2
Frequency	SoSe und WiSe

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	• Master's Programme Molecular Biomedicine (Master) > Skills Modules • Master's Programme Neuroscience (Master) > Skills Modules
Zuständige Personen	• Dedek, Karin (module responsibility) • Groß, Petra (Prüfungsberechtigt) • Dedek, Karin (Prüfungsberechtigt) • Solovyeva, Vita (Prüfungsberechtigt)
Prerequisites	Enrolment in Master´s programmes Molecular Biomedicine and Neuroscience.
Skills to be acquired in this module	**Competencies:** + deepened biological expertise ++ deepened knowledge of biological working methods + data analysis skills ++ interdisciplinary thinking ++ critical and analytical thinking ++ data presentation and discussion (written and spoken) + team work
Module contents	The module focuses on microscopy, imaging and methods of microscopy. **Lecture:** Basics in optics, microscopy methods, image processing, biomedical applications **Seminar:** Examples for selected microscopy methods and their application. Different microscopical methods and their applications are discussed and compared. Students will understand the basics and limitations of microscopy methods and learn to evaluate them. Selected methods are demonstrated.
Literaturempfehlungen	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

Form of instruction	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		1	WiSe	14
Seminar		1	WiSe	14
Präsenzzeit Modul insgesamt				28 h

Abschlussmodul

mam - Master Thesis

Module label	Master Thesis
Modulkürzel	mam
Credit points	30.0 KP
Workload	900 h (2 SWS Seminar (SE): 28 h contact, 62 h individual preparation (reading, preparation of presentations) 18 SWS Thesis project: total 810 h.Percentages of contact (individual supervision) and independent work (independent lab work, data analysis, reading, thesis writing) depend on the topic an methods of the thesis project)
Verwendbarkeit des Moduls	• Master's Programme Neuroscience (Master) > Abschlussmodul
Zuständige Personen	• Kretzberg, Jutta (module responsibility) • der Neuroscience, Lehrende (Prüfungsberechtigt) • Bräuer, Anja (Prüfungsberechtigt) • Debener, Stefan (Prüfungsberechtigt) • Herrmann, Christoph Siegfried (Prüfungsberechtigt) • Kranczioch-Debener, Cornelia (Prüfungsberechtigt) • Lücke, Jörg (Prüfungsberechtigt) • Milenkovic, Ivan (Prüfungsberechtigt) • Puschmann, Sebastian (Prüfungsberechtigt) • Ruigendijk, Esther (Prüfungsberechtigt) • Sörös, Peter (Prüfungsberechtigt) • Özyurt, Jale Nur (Prüfungsberechtigt) • Albert, Jörg (Module counselling)
Prerequisites	The start of the master thesis requires prior completion of at least 60 ECTS. Prior to the start of the thesis project, the form for application for the final thesis and final oral examination needs to be submitted to the examination office and approved by the examination committee. External examiners (not listed on the list of neuroscience examiners) need to apply for the status of an official examiner prior to the start of the project. Depending on project choice, please ask the supervisor for additional requirements.
Skills to be acquired in this module	++ Neurosci. knowlg. ++ Expt. Methods ++ Independent research ++ Scient. Literature ++ Social skills + Interdiscipl. knowlg. + Maths/Stats/Progr. ++ Data present./disc. + Scientific English + Ethics In their Master thesis, students perform individual research projects in the

limited time of 6 month. Learning goals:

- planning and organization of a research project
- teamwork in a research group
- formulate a scientific hypothesis
- planning, performing and analyzing experiments and / or simulations
- working with scientific background literature on the specific context of the project
- oral presentation and discussion of backgrounds and results in the lab seminar
- write a scientific report
- optional: Prepare and present a scientific poster

Module contents

The master thesis comprises 6 months of experimental or theoretical work and thesis writing, and a regular seminar for training, reporting and feedback advice during that time. The aim, methods and results of the thesis are presented in a final oral presentation and exam (Master's colloquium).

Students can choose between many options of individual projects, offered by the different groups involved in the MSc Neuroscience study program. Research questions, methods and approaches differ between individual projects. The timing of projects is by individual arrangement with the supervisor. Note that, for some options, priority for admission to the project is given to students who passed a background and / or research module offered by the supervisor

Please refer to the Stud.IP MSc Neuroscience information community forum for information on the groups and contact potential supervisors directly.

The master thesis project is generally carried out under the guidance and supervision of a member of the Neuroscience faculty at the University of Oldenburg (see list of examiners) and additionally evaluated by a second examiner. External master thesis projects and / or evaluation by persons who are not on the list of examiners need prior approval by the examination committee.

Participation in the Stud.IP workshop on science communication (https://elearning.uni-oldenburg.de/dispatch.php/course/overview?cid=6fc0dbbfa53d7b3f5e3680f52ac7d0f7) and a poster presentation at the biology & neuroscience student poster symposium is not mandatory but highly recommended.

Literaturempfehlungen

Provided by the supervisor, depending on the project.

Links	
Languages of instruction	
Duration (semesters)	1 Semester
Module frequency	every semester
Module capacity	unlimited
Type of module	Pflicht / Mandatory
Module level	MM (Mastermodul / Master module)
Teaching/Learning method	Individual project
Previous knowledge	Depending on selected option – please contact the supervisor

Examination	Prüfungszeiten	Type of examination
Final exam of module	within 6 months after approval of the application	Thesis (90%), oral presentation (10 %)

Form of instruction	Seminar
SWS	2
Frequency	SoSe und WiSe