Background Modules

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

Form of instruction	Comment	SWS	Frequency	Workload of compulsory attendance
Exercises		5	WiSe	70
Präsenzzeit Modul insgesamt				112 h

bio655 - Ornithology in theoretical Concepts

Module label	Ornithology in theoretical Concepts
Modulkürzel	bio655
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
Zuständige Personen	• Liedvogel, Miriam (module responsibility) • Bouwhuis, Sandra (Module counselling) • Köppl, Christine (Module counselling) • Langemann, Ulrike (Module counselling) • Mouritsen, Henrik (Module counselling) • Schmaljohann, Heiko (Module counselling) • Liedvogel, Miriam (Prüfungsberechtigt) • Bouwhuis, Sandra (Prüfungsberechtigt) • Köppl, Christine (Prüfungsberechtigt) • Langemann, Ulrike (Prüfungsberechtigt) • Mouritsen, Henrik (Prüfungsberechtigt) • Schmaljohann, Heiko (Prüfungsberechtigt)
Prerequisites	
Skills to be acquired in this module	The aim of the module is to consolidate various aspects of ornithology. The module imparts advanced knowledge on different aspects of ornithology. The students acquire: An extended knowledge of behavioural, sensory, morphological and physiological characteristics in birds and relevant fundamental concept in conservation, ecology and evolution smorphological and physiological fundamentals and the resulting ecological and behaviour-biological consequences in birds Knowledge, presentation and discussion of relevant English literature from various fields of ornithology ++ broad and deepened biological expertise + deepened in depths knowledge of biological working methods + interdisciplinary thinking + critical and analytical thinking + independent searching and knowledge of scientific literature ++ data presentation and discussion in German and English (written and spoken)
Module contents	The module is composed of the lecture “Ecology, evolution and sensory biology in birds”, a seminar accompanying the lecture “Current Questions in Ornithology”, a seminar “Behavioural Ecology of Birds", and a seminar "Methods in Field Ornithology". Lecture “Ecology, evolution and sensory biology in birds”: This lecture covers in-depth and specific aspects of phylogeny, speciation and hybridisation, bird migration, orientation, behavioural ecology, population biology, life history and sensory systems of birds. Seminar “Current Questions of Ornithology”: In this seminar, original English publications are presented and discussed which deal with current research results from various fields covered in the lectures. Every student reads a paper on one scientific article, presents the studyand discusses the results of that article with the other participants. Seminar “Behavioural Ecology of Birds” (option 1):

	In the seminar, current literature relating to the life history of birds will be reported. During the term, each participant is presenting an original paper in a short talk and the group of students will be guided to critically discuss the paper. Seminar "Methods in Field Ornithology" (option 2): The core methods of field ornithology, such as stable isotopes, bird census, ringing, radar, radio tracking, etc., will be introduced with the help of English scientific papers by the students. In the presentations the corresponding methods will be explained in detail with an emphasis on the pros and cons of the method. The aim of this seminar is to learn how to deal with scientific methods in a critical way.
Literaturempfehlungen	
	Bairlein F (2022) Das große Buch vom Vogelzug: Eine umfassende Gesamtdarstellung. AULA-Verlag Bennett PM, Owens IPF (2002) Evolutionary Ecology of birds: Life histories, mating systems, and extinction. Oxford Berthold P, Gwinner E, Sonnenschein E (2003) Avian migration. Springer, Berlin. Carey C (1996) Avian energetics and nutritional ecology. Chapman & Hall, New York. Catchpole CK, Slater PJB (1995) Bird song. Cambridge UP, Cambridge. Danchin E, Giraldeau L-A, Cezilly F (2008) Behavioural Ecology. Oxford Gill FB (2007). Ornithology, 3rd edition (London: W.H. Freeman & Company) Lovette IJ, Fitzpatrick JW (2017) Handbook of Bird Biology – The Cornell Lab of Ornithology (2017). 3rd edition Scanes CG (2015) Sturkie's Avian Physiology, 6th edition. Academic Press Scott G (2010) Essential Ornithology. Oxford University Press, Oxford.
Links	
	Partiticipating Institution: Institute of Avian Research für Vogelforschung http://www.ifv-vogelwarte.de https://ifv-vogelwarte.de/en/home

Language of instruction	English
Duration (semesters)	1 Semester
Module frequency	winter term
Module capacity	30
Reference text	associated with bio663
Type of module	Wahlpflicht / Elective
Module level	MM (Mastermodul / Master module)
Teaching/Learning method	Lecture, seminar

Examination	Prüfungszeiten	Type of examination
Final exam of module	exam during final lecture week	3 exams: - 2 presentations (20% each; the main seminar is mandatory, one of the two options need to be taken in addition) - 1 written exam or 1 oral exam (60%) Regular active participation is required for the module to be passed successfully.

Form of instruction	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		4	WiSe	56
Seminar		4	WiSe	56
Präsenzzeit Modul insgesamt				112 h

bio663 - Ornithology in Practice

Module label	Ornithology in Practice
Modulkürzel	bio663
Credit points	12.0 KP
Workload	360 h (2 weeks, 40h/week. Types of programme may differ slightly between the four different courses.)
Verwendbarkeit des Moduls	• Master's Programme Biology (Master) > Background Modules
Zuständige Personen	• Liedvogel, Miriam (module responsibility) • Bouwhuis, Sandra (Module counselling) • Langemann, Ulrike (Module counselling) • Vedder, Oscar Herman (Module counselling) • Schmaljohann, Heiko (Module counselling) • Liedvogel, Miriam (Prüfungsberechtigt) • Bouwhuis, Sandra (Prüfungsberechtigt) • Langemann, Ulrike (Prüfungsberechtigt) • Vedder, Oscar Herman (Prüfungsberechtigt) • Schmaljohann, Heiko (Prüfungsberechtigt)
Prerequisites	
Skills to be acquired in this module	The aim ++ broad and in depths biological expertise ++ in depths 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 in German and English (written and spoken) + teamwork + project and time management + statistics and scientific programming of the module is to consolidate various aspects of ornithology as well as to impart up to date methods applied in ornithological research.
Module contents	The module comprises four required elective courses (6 CP each), two of which have to be chosen. Required elective course 1: Laboratory course and seminar "Ecology of Colonial Seabirds" (6 CP) The Institute of Avian Research safeguards a long-term individual-based study on common terns: colonially breeding, migratory, piscivorous seabirds. Students spend a week at the colony (located at the Banter See in Wilhelmshaven) to ask a scientific question (e.g. about foraging behaviour, coloniality or courtship behaviour) and collect data to answer it, then spend a week analysing the data statistically, writing a short report in Biology Letters format and presenting their results to their peers. Students receive one mark for the report and one for the presentation and the final mark for the course will be the average of these two marks. Required elective course 2: Laboratory course and seminar “Communication in Birds” (6 CP). Original recordings from bird songs will be used to generate new data sets for the practical. From these recordings we will prepare spectrograms and analyze the waveforms and frequency spectra. Techniques and statistical method that allow to classify song types from individuals or from populations will be introduced and applied. For example, cluster analysis and discriminant analysis are statistical methods to assess the dissimilarity between "objects" or song type characteristics. The theoretical background for the practical is provided by the seminar using a standard text book on bird

	song Catchpole & Slater 2008). Required elective course 3: Laboratory course and seminar “Japanese Quail” (6 CP).Observations and investigations of behaviour in relation to reproductive activity of male and female Japanese quail, at the Institute of Avian Research. Students will learn about theory regarding pace of life and exploration behaviour and develop predictions for inter-individual differences in exploration behaviour in relation to sex and reproductive activity. These predictions will be tested with standardized behavioural observations and measurements of food intake in the quail. The data will be analysed and discussed in the broader context of life-history theory. Required elective course 4: Laboratory course and seminar “Scientific research in field ornithology, incl. identification of birds” (6 CP) This course has three teaching objectives. Firstly, to impart knowledge of the local bird community. This is conveyed through practical courses, work on bird specimens, and lectures. Secondly, learning and getting to know some standard methods of field ornithology, e.g. breeding survey, waterbird counts, radio telemetry, mist netting. Both teaching objectives form the basis for the third teaching objective. In this, the students independently conduct a scientific ornithological study. The data are analysed in the course under supervision. The results are summarised in a two-page scientific publication. At the end of the course, a kind of scientific conference takes place, in which all scientific projects are presented and discussed. The final grade is made up of the grades for the presentations and the scientific publication.
Literaturempfehlungen	Required elective course 1: Becker PH, Frank D, Südman SR (1993) Temporal and spatial pattern of common tern (Sterna Hirundo) foraging in the Wadden Sea. Oecologia 93: 389-393. González-Solís J, Sokolov E, Becker PH (2001) Courtship feedings, copulations and paternity in common terns Sterna hirundo. Animal Behaviour 61: 1125-1132 Required elective course 2: Catchpole CK & Slater PJB (2008), "Bird Song, Biological themes and variations", Cambridge University Press, 2nd Edition Required elective course 3: Reale, D., Garant, D., Humphries, M.M., Bergeron, P., Careau, V., Montiglio, P.O. (2010) Personality and the emergence of the pace-of-life syndrome concept at the population level. Phil. Trans. R. Soc. B, 365, 4051–4063. Required elective course 4: Bibby, Burgess, Hill (1995) Methoden der Feldonrithologie Jonsson (1999) Die Vögel Europas und des Mittelmeerraumes Südbeck, Andretzke, Fischer, Gedeon, Schikore, Schröder, Sudfeld (2012) Methodenstandards zur Erfassung der Brutvögel Deutschlands Sutherland, Newton, Green (2004) Bird Ecology and Conservation: A Handbook of Techniques Svensson, Mullarney, Zetterström (2011) Der Kosmos Vogelführer: Alle Arten Europas, Nordafrikas und Vorderasiens
Links	
Language of instruction	English
Duration (semesters)	1 Semester
Module frequency	Summer Term
Module capacity	12 (number of students varies between the four required elective courses. for REC1 it is 8, for REC2 it is 9, for REC3 it is 4, for REC4 it is 12)
Type of module	Wahlpflicht / Elective

Module level	MM (Mastermodul / Master module)	
Teaching/Learning method	Exercise, seminar	
Examination	Prüfungszeiten	Type of examination
Final exam of module	within the two weeks per required elective course	1 exam: 1 portfolio (2 presentations, 2 reports)
Form of instruction	Seminar und Übung	
SWS	8	
Frequency	SoSe	

bio675 - Molecular Ecology

Module label	Molecular Ecology
Modulkürzel	bio675
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 Landscape Ecology (Master) > Wahlpflichtmodule
Zuständige Personen	• Nolte, Arne (module responsibility) • Gerlach, Gabriele (Module counselling) • Nolte, Arne (Prüfungsberechtigt) • Gerlach, Gabriele (Prüfungsberechtigt) • Dennenmoser, Stefan (Prüfungsberechtigt)
Prerequisites	
Skills to be acquired in this module	The field of molecular ecology strives to identify relationships between species genotypes, phenotypes and ecological factors. It addresses questions about how organisms adapt and explains patterns of distribution and biodiversity. During the course, participants will get to know the biological background to design an experiment in the field of molecular ecology. We will discuss the state of the art according to literature. Participants will perform sampling and conduct steps of the analysis. The course will cover field methods (sampling) and lab methods (behavior experiments, genetic analyses, phenotypic analyses) as well as computer based analyses. ++ deepened biological expertise ++ deepened knowledge of biological working methods ++ data analysis skills + interdisciplinary thinking + critical and analytical thinking + independent searching and knowledge of scientific literature ++ ability to perform independent biological research ++ data presentation and discussion (E) (written and spoken) + statistics & scientific programming
Module contents	Lecture: AN/GG - Molecular ecology background of specific study systems. The lectures will introduce a study system that will be analyzed during the course (study systems may vary from year to year). It is the goal of the lecture to provide students with background information to develop an experimental design of a field study during the practical. Excercise: AN/GG - Mixed course with laboratory and field exercises. Samples will be collected in the field. One goal of the course is to apply modern analyses to understand how organisms are distributed. Another aspect is the application of molecular markers to analyze behavioral experiments.
Literaturempfehlungen	will be announced during the course
Links	
Language of instruction	English
Duration (semesters)	1 Semester
Module frequency	summer term
Module capacity	15
Reference text	associated with bio890 Current Topics of Biology (Seminar)
Type of module	Wahlpflicht / Elective
Module level	MM (Mastermodul / Master module)
Teaching/Learning method	Lecture, Exercise
Previous knowledge	Reading English literature and presenting seminar topics in English. Basic knowledge of working in a gene laboratory and with a computer.

Examination	Prüfungszeiten	Type of examination
Final exam of module	during the module	Presentations (50%), Portfolio (50%). Regular participation is a prerequisite to pass in the module.

Form of instruction	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		2	SoSe	28
Exercises		6	SoSe	84

Form of instruction	Comment	SWS	Frequency	Workload of compulsory attendance
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

bio703 - Basic Concepts in Plant Sciences

Module label	Basic Concepts in Plant Sciences
Modulkürzel	bio703
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 Landscape Ecology (Master) > Wahlpflichtmodule
Zuständige Personen	• Zotz, Gerhard (module responsibility) • Albach, Dirk Carl (Module counselling) • von Hagen, Klaus Bernhard (Module counselling) • Zotz, Gerhard (Prüfungsberechtigt) • Albach, Dirk Carl (Prüfungsberechtigt) • von Hagen, Klaus Bernhard (Prüfungsberechtigt) • Will, Maria (Prüfungsberechtigt)
Prerequisites	
Skills to be acquired in this module	Communicating deeper knowledge in ecology, phylogeny, evolution and genetics of plants Communicating scale- and method-overarching thinking Communicating deeper theoretic concepts of ecology, evolution and genetics of plants. ++ deepened biological expertise + deepened knowledge of biological working methods + data analysis skills + interdisciplinary thinking ++ critical and analytical thinking ++ independent searching and knowledge of scientific literature + ability to perform independent biological research ++ data presentation and discussion in English (written and spoken) + teamwork ++ ethics and professional behaviour
Module contents	V: Biodiversity of plants (2 SWS) V: Resource acquisition and use by plants (1 SWS) V: Gene expression in plants (1 SWS) S: Phylogeny of plants (2 SWS) S: Interactions of plants with environmental parameters (2SWS)
Literaturempfehlungen	Kadereit, J.W., Körner, C., Kost, B., Sonnewald, U., 2014, Strasburger Lehrbuch der Botanik. Springer Spektrum Verlag, Heidelberg. Lambers H, Chapin III FS, Pons TL. 2008. Plant Physiological Ecology. New York: Springer.
Links	
Language of instruction	English
Duration (semesters)	1 Semester
Module frequency	annually, winter term
Module capacity	12
Reference text	associated with bio765 (Current Methods in Plant Science) (recommended)
Type of module	Wahlpflicht / Elective
Module level	MM (Mastermodul / Master module)
Teaching/Learning method	Lecture, seminar
Previous knowledge	Ecology, flora, genetics

Examination	Prüfungszeiten	Type of examination
Final exam of module		1 Portfolio

Form of instruction	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		4	WiSe	56
Seminar		4	WiSe	56
Präsenzzeit Modul insgesamt				112 h

bio720 - Marine Biodiversity

Module label	Marine Biodiversity
Modulkürzel	bio720
Credit points	15.0 KP
Workload	450 h
Verwendbarkeit des Moduls	• Master's Programme Biology (Master) > Background Modules • Master's Programme Biology (Master) > Background Modules
Zuständige Personen	• Martinez Arbizu, Pedro Miguel (module responsibility) • Martinez Arbizu, Pedro Miguel (Prüfungsberechtigt) • Wehrmann, Achim (Prüfungsberechtigt) • Rossel, Sven (Prüfungsberechtigt) • Gutt, Julian (Prüfungsberechtigt) • Kröncke, Ingrid (Prüfungsberechtigt)
Prerequisites	
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 ++ ability to perform independent biological research ++ data presentation and discussion (written and spoken) (E) ++ teamwork + ethics and professional behaviour + project and time management ++ statistics & scientific programming Knowledge of fundamentals, topical subjects and methods in Marine Biology and Marine Geology. Studies and critical assessment of the scientific literature.
Module contents	L: (AW) General Marine Geology E: Biogenic sedimentation, Interaction benthos-sediment; (SS) Plankton of the oceans; (MH) unicellular plankton; (IK) benthos of the North-Sea; (PM) biodiversity in the deep sea and on sea-mountains; (JG) conceptions and hypotheses of marine biodiversity, biodiversity of marine vertebrates; (GG) animal migrations and dispersal behaviour. Methods and scientific work on research vessels. A lecture comprises the above-mentioned subjects and imparts marine biological theories, research results and methods. In the seminar, research is presented and discussed. In the laboratory course/exercises, subjects are treated in coordination with the contents of the lecture. With the aid of a computer, data are analysed and interpreted statistically.
Literaturempfehlungen	as announced in the lecture
Links	
Languages of instruction	English , German
Duration (semesters)	1 Semester
Module frequency	winter term
Module capacity	unlimited
Type of module	Wahlpflicht / Elective
Module level	MM (Mastermodul / Master module)
Teaching/Learning method	Lecture, seminar, exercise

Examination	Prüfungszeiten	Type of examination
Final exam of module		Written examination (60 %), short presentation (20%), practical exercise (20%) Regular active participation is required for the module to be passed.

Form of instruction	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		3	WiSe	42
Exercises		9	WiSe	126
Seminar		1	WiSe	14
Präsenzzeit Modul insgesamt				182 h

bio733 - Evolutionary Biology Population Genetics

Module label	Evolutionary Biology Population Genetics
Modulkürzel	bio733
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
Zuständige Personen	• Gerlach, Gabriele (module responsibility) • Albach, Dirk Carl (Module counselling) • Khan, Gulzar (Module counselling) • Gerlach, Gabriele (Prüfungsberechtigt) • Albach, Dirk Carl (Prüfungsberechtigt) • Khan, Gulzar (Prüfungsberechtigt)
Further responsible persons	Levent Khan
Prerequisites	none
Skills to be acquired in this module	+ deepened biological expertise ++ deepened knowledge of biological working methods ++ data analysis skills ++ critical and analytical thinking ++ independent searching and knowledge of scientific literature ++ data presentation and discussion (E) (written and spoken) + teamwork ++ statistics & scientific programming
Module contents	Lecture conveys knowledge about the fields of population genetics, evolution and speciation. Important laboratory methods regarding DNA sequencing will be learned as well as basics and background information on the analysis of dispersal, distribution, genetic diversity of plant and animal species. Exercise: Data sets and methods will be analysed to determin distribution and genetic exchange between populations
Literaturempfehlungen	current papers in Evolutionary Biology Futuyama D. Evolutionary Biology, Elsevier, Hartl & Clark Principles of Population Genetics, Sinauer
Links	
Language of instruction	English
Duration (semesters)	1 Semester
Module frequency	winter term
Module capacity	12
Reference text	associated with bio736 (Evolutionary Transcriptomics) (recommended)
Type of module	Wahlpflicht / Elective
Module level	MM (Mastermodul / Master module)
Teaching/Learning method	Lecture, excercise
Previous knowledge	Basic knowledge of evolutionary biology

Examination	Prüfungszeiten	Type of examination
Final exam of module		portfolio (presentation, laboratory protocol)

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

bio736 - Evolutionary Transcriptomics

Module label	Evolutionary Transcriptomics
Modulkürzel	bio736
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
Zuständige Personen	• Nolte, Arne (module responsibility) • Dennenmoser, Stefan (Module counselling) • Nolte, Arne (Prüfungsberechtigt) • Dennenmoser, Stefan (Prüfungsberechtigt)
Prerequisites	none
Skills to be acquired in this module	+ deepened biological expertise ++ deepened knowledge of biological working methods ++ data analysis skills; ++ critical and analytical thinking + independent searching and knowledge of scientific literature ++ data presentation and discussion in English (written and spoken) ++ statistics & scientific programming
Module contents	Lecture: Gene expression represents the first step of the translation of genomic information into a phenotype. This phenotype is of broad interest in all disciplines of biology. Gene expression data can reveal how genetic changes at single genes manifest phenotypically and how gene expression is regulated. The same data can also explain differences in life history and adaptation to different environments. Different perspectives can be understood by studying mechanisms of gene regulation as well as broad scale transcriptomics analyses. Exercise: We will generate and analyze gene expression data during the course including wet lab and computational methods. Practicals include the analysis of single-gene expression data as well as RNAseq data representing complete transcriptomes.
Literaturempfehlungen	
Links	
Language of instruction	English
Duration (semesters)	1 Semester
Module frequency	winter term
Module capacity	12
Reference text	associated with bio733: Evolutionary Biology Population Genetics (recommended)
Type of module	Wahlpflicht / Elective
Module level	MM (Mastermodul / Master module)
Teaching/Learning method	Lecture, exercise
Previous knowledge	Basic knowledge of evolutionary biology

Examination	Prüfungszeiten	Type of examination
Final exam of module		portfolio (presentation, laboratory protocol)

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

bio765 - Current Methods in Plant Sciences - Ecology, Phylogeny and Molecular Biology

Module label	Current Methods in Plant Sciences - Ecology, Phylogeny and Molecular Biology
Modulkürzel	bio765
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 Landscape Ecology (Master) > Wahlpflichtmodule
Zuständige Personen	• Albach, Dirk Carl (module responsibility) • Zotz, Gerhard (Module counselling) • Will, Maria (Module counselling) • Khan, Gulzar (Module counselling) • von Hagen, Klaus Bernhard (Module counselling) • Will, Maria (Prüfungsberechtigt) • Albach, Dirk Carl (Prüfungsberechtigt) • Zotz, Gerhard (Prüfungsberechtigt) • Khan, Gulzar (Prüfungsberechtigt) • von Hagen, Klaus Bernhard (Prüfungsberechtigt)
Prerequisites	
Skills to be acquired in this module	Acquaintance and practicing ecological, phylogenetic and molecular methods Communication of scale- and method-overarching thinking and project planning Knowledge of current methods and questions in plant science Capacity for teamwork, project- and time management ++ deepened biological expertise ++ deepened knowledge of biological working methods ++ data analysis skills ++ interdisciplinary thinking + critical and analytical thinking + independent searching and knowledge of scientific literature + ability to perform independent biological research + data presentation and discussion (written and spoken) + teamwork + statistics & scientific programming
Module contents	Current Methods in Plant Science. Subject to annual change. The specific topics for the coming semester will be presented at the module introduction during the orientation week, please check the community-Forum: 5.02.InfoB Informationen MSc Biology for the schedule: https://elearning.uni-oldenburg.de/dispatch.php/course/details?sem_id=d35edd08df0fb5c6a8ae3a81ea738b88&again=yes
Literaturempfehlungen	
Links	
Language of instruction	English
Duration (semesters)	1 Semester
Module frequency	annually, winter term
Module capacity	12
Reference text	associated with bio703 (Basic Concepts in Plant Sciences) (recommended)
Type of module	Wahlpflicht / Elective
Module level	MM (Mastermodul / Master module)
Teaching/Learning method	Exercise
Previous knowledge	Ecology, flora, genetics

Examination	Prüfungszeiten	Type of examination
Final exam of module		Portfolio

Form of instruction	Exercises
SWS	8
Frequency	WiSe

bio770 - Field Methods in Organismal Biology

Module label	Field Methods in Organismal Biology
Modulkürzel	bio770
Credit points	15.0 KP
Workload	450 h
Verwendbarkeit des Moduls	• Master's Programme Biology (Master) > Background Modules • Master's Programme Biology (Master) > Background Modules • Master's Programme Landscape Ecology (Master) > Wahlpflichtmodule
Zuständige Personen	• Zotz, Gerhard (module responsibility) • Gerlach, Gabriele (Module counselling) • Albach, Dirk Carl (Module counselling) • von Hagen, Klaus Bernhard (Module counselling) • Mouritsen, Henrik (Module counselling) • Nolte, Arne (Module counselling) • Schmaljohann, Heiko (Module counselling) • Zotz, Gerhard (Prüfungsberechtigt) • Gerlach, Gabriele (Prüfungsberechtigt) • Albach, Dirk Carl (Prüfungsberechtigt) • Will, Maria (Prüfungsberechtigt) • von Hagen, Klaus Bernhard (Prüfungsberechtigt) • Mouritsen, Henrik (Prüfungsberechtigt) • Nolte, Arne (Prüfungsberechtigt) • Khan, Gulzar (Prüfungsberechtigt) • Schmaljohann, Heiko (Prüfungsberechtigt)
Prerequisites	
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 ++ ability to perform independent biological research + data presentation and discussion (E) (written and spoken) ++ project and time management ++ statistics & scientific programming The molecule aims at enabling students to apply theoretical knowledge to practical, hypothesis-based field studies within the scope of a seminar. The data derived from the individual projects performed are then to be documented and discussed in the form of a written laboratory course report oriented by a scientific publication and to be written in English. Several teachers cooperate to enable interdisciplinary approaches (e.g. botanical-zoological approaches).
Module contents	S: Biogeographic and ecological classification and characterization of a biome (e.g. Mediterranean region, moist tropics, boreal zone), independent identification and treatment of scientific questions, presentation of scientific results in a “mini symposium” subsequent to the field studies. E: Planning and performing a field study project, data analysis, written report in the form of a scientific publication
Literaturempfehlungen	Varies with topic and field locality
Links	www.uni-oldenburg.de/fun_eco/
Language of instruction	English
Duration (semesters)	1 Semester
Module frequency	annually in summer term
Module capacity	21
Type of module	Wahlpflicht / Elective
Module level	MM (Mastermodul / Master module)
Teaching/Learning method	Seminar, exercise

Examination	Prüfungszeiten	Type of examination
Final exam of module		2 Presentations (30 %) Laboratory course report on project work (70 %) PLEASE NOTE: Additional conditions regarding attendance and ungraded activities as determined by the persons responsible for the module will apply.

Form of instruction	Comment	SWS	Frequency	Workload of compulsory attendance
Exercises		10	SoSe	140
Seminar		2	SoSe	28
Seminar (Pflichtveranstaltung für Erstsemester OHNE bisherige Belehrung)			WiSe	0
Präsenzzeit Modul insgesamt				168 h

bio773 - Sequence based Biomonitoring

Module label	Sequence based Biomonitoring
Modulkürzel	bio773
Credit points	12.0 KP
Workload	360 h
Verwendbarkeit des Moduls	• Master's Programme Biology (Master) > Background Modules
Zuständige Personen	• Nolte, Arne (module responsibility) • Dennenmoser, Stefan (Module counselling) • Nolte, Arne (Prüfungsberechtigt) • Dennenmoser, Stefan (Prüfungsberechtigt) • Martinez Arbizu, Pedro Miguel (Prüfungsberechtigt) • Albach, Dirk Carl (Prüfungsberechtigt) • Khan, Gulzar (Prüfungsberechtigt)
Prerequisites	none
Skills to be acquired in this module	+ deepened biological expertise ++ deepened knowledge of biological working methods ++ data analysis skills ++ critical and analytical thinking + independent searching and knowledge of scientific literature ++ data presentation and discussion in English (written and spoken) ++ statistics and scientific computing
Module contents	*Content of the module:* Lecture: The identification of organisms based on DNA sequences is well established and databased dedicated for this purpose are growing through ‚barcoding of life' initiatives. Such information can be used to assign sequences extracted from environmental samples to individual species. This can be used to obtain species inventories and to study communities. While these methods are already used in fundamental research, they are only slowly adopted by fields such as conservation and ecosystem monitoring. The lecture covers concepts, methods, promises and problems of sequence based biomonitoring. Seminar: participants present topics relevant to the module. Exercise: We will generate and analyse sequence data data from environmental samples to generate species inventories for terrestrial and aquatic ecosystems. For this purpose we will extract eDNA from samples and apply next generation sequencing. The read data will be jointly analysed on the university hpc cluster. The participants will study methods and concepts associated with the analyses and present them in short presentations. The key aspect in the practical cours is to assign sequences to species and to discuss the applicability of the methods in fundamental research and in applied, management oriented research.
Literaturempfehlungen	
Links	
Language of instruction	English
Duration (semesters)	1 Semester
Module frequency	annually in winter term
Module capacity	16
Reference text	recommended : bio733 Evolutionary Biology Population Genetics bio675 Molecular Ecology
Type of module	Wahlpflicht / Elective
Module level	MM (Mastermodul / Master module)
Teaching/Learning method	Lecture, exercise, seminar

Previous knowledge	Useful previous knowledge: - Evolutionary Biology - reading of scientific literature and presentation of seminar topics in english - Basic knowledge about molecular laboratory work and computer skills - experience with species inventory in the field

Examination	Prüfungszeiten	Type of examination
Final exam of module		portfolio (presentation, results protocol)

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

bio780 - Biodiversity of Littoral Communities

Module label	Biodiversity of Littoral Communities
Modulkürzel	bio780
Credit points	15.0 KP
Workload	450 h
Verwendbarkeit des Moduls	• Master's Programme Biology (Master) > Background Modules • Master's Programme Biology (Master) > Background Modules
Zuständige Personen	• Martinez Arbizu, Pedro Miguel (module responsibility) • Martinez Arbizu, Pedro Miguel (Prüfungsberechtigt)
Prerequisites	Safe apnoediving with aptitude test and medical fitness certificate
Skills to be acquired in this module	+ deepened knowledge of biological working methods + ability to perform independent biological research ++ teamwork + ethics and professional behaviour + project and time management By actively participating in this module students acquire qualifications in the following fields: Biological oceanography, marine biology and marine ecology: - Geological formation history of the Mediterranean Sea and Atlantic Ocean, respectively, or the Red Sea and adjacent seas - Oceanography and hydrology - Development of the faunal and floral composition of the Atlantic Ocean, the Mediterranean Sea and the Mediterranean region or the Red Sea (biogeography) - Commercial utilization of the seas and its impacts - Biotopes and biotic communities - Evolution, systematics, morphology, modes of life, and ecology of selected animal groups - Applying theoretical knowledge to real-world organisms/systems - Improved and specialized knowledge of species - Adaptation of life cycles - Interaction between organisms and environment - Dynamics of reef-building and reef-degrading processes - Threat to coral reefs/protection of marine environments Methods: - Formulation and definition of scientific approaches and selection of methods - Observation and investigation of organisms and their habitats (snorkelling/diving) - Documentation of small research projects in groups in the style of a scientific publication - Editorial work to prepare a module report - Popular presentation of results to be published by the media and to be presented at the University Further skills: - Social engagement in groups/teamwork in projects - Independent scientific work in groups - Improvement of scientific discussion culture - Consciousness of the threat to coral reefs - Practising English - Dealing with the culture of the visited region Culture: - History, culture, politics, and religion Additionally: - Physiological aspects of apnoediving - Measures in case of accidents (also caused by "poisonous" organisms)
Module contents	Biodiversity of littoral biotic communities – topographical field research
Literaturempfehlungen	GRÜTER, W., 2001: Leben im Meer - Vielfalt und Zusammenhänge. Dr. Friedrich Pfeil Verlag, München. %% Should be read prior to a marine biological excursion! This book will arouse your curiosity about the submarine world. A reading book!%% HEMPEL, G., HEMPEL, I. & S. SCHIEL (HRSG.), 2006: Faszination Meeresforschung – Ein biologisches Lesebuch. Hauschild Verlag. %% This textbook is information and fun for all readers interested in marine life as well as in the protection of marine environments.%% HOFRICHTER, R., 2001: Das Mittelmeer - Fauna, Flora, Ökologie. Spektrum Akademischer Verlag, Heidelberg - Berlin: Band I, II, III. %%The textbook for the Mediterranean Sea! The general 1st part provides valuable information on symbioses or feeding types, for example.%% LALLI, C. M. & T. R., PARSONS, 1997: Biological Oceanography: An Introduction. 2. Edition. The Open University, Butterworth, Heinemann. %%Very compact, explanatory! Not expensive! A must for biological oceanography! Recommended for preparing examinations! Provides basic information!%% NYBAKKEN, J. W. & M. D. MERTNESS, 2005: Marine Biology - An ecological approach. Pearson, Education paperback book. Addison, Wesley, Publishers. %%Highly illustrative! Much additional information on different fields! The authors provide a unique ecological approach that helps students understand the real-world relevance of marine biology by exploring how organisms interact within their individual ecosystems.%% SOMMER, U., 2005: Biologische Meereskunde. 2. Auflage, Springer Verlag, Berlin, Heidelberg. %%Connecting biological oceanography with theoretical ecology!%% Literature study: Web of science: externhttp://www.bis.uni-oldenburg.de – Data banks(DBIS) – Biology – TOP data banks, e.g. ASFA, Science Citation Index, Zoological Record hhtp://www.biodiversitylibrary.org/bibliogrphy/14107 externhttp://scholar.google.de/ externhttp://www.vifabio.de Open access journals: externhttp://www.doaj.org/ - externhttp://www.plosone.org
Links	

Languages of instruction	English , German
Duration (semesters)	1 Semester
Module frequency	annually in summer term
Module capacity	unlimited
Type of module	Wahlpflicht / Elective
Module level	MM (Mastermodul / Master module)
Teaching/Learning method	Exercise, seminar

Examination	Prüfungszeiten	Type of examination
Final exam of module	during the lectures	2 short presentations (30 %), 1 internship report (70 %) (project report in the style of a scientific publication) PLEASE NOTE: Additional conditions regarding attendance and ungraded activities as determined by the persons responsible for the module will apply.

Form of instruction	Comment	SWS	Frequency	Workload of compulsory attendance
Exercises		9	SoSe	126
Seminar		3	SoSe	42
Seminar (Pflichtveranstaltung für Erstsemester OHNE bisherige Belehrung)			WiSe	0
Präsenzzeit Modul insgesamt				168 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	

bio860 - Comparative Developmental Biology

Module label	Comparative Developmental Biology
Modulkürzel	bio860
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
Zuständige Personen	• Sienknecht, Ulrike (module responsibility) • Sienknecht, Ulrike (Prüfungsberechtigt)
Prerequisites	
Skills to be acquired in this module	++ deepened biological knowledge ++ deepened knowledge of techniques in biology ++ knowledge in data analysis and presentation + cross-disciplinary knowledge and thinking ++ critical and analytical thinking + independent searching and knowledge of scientific literature ++ ability to perform independent biological research ++ data presentation and discussion (E) (written and spoken) + team work + ethics and professional behaviour ++ project and time management
Module contents	Lectures and Lab exercises in topics of evolutionary developmental biology, i.e. comparative develop-mental biology, such as the development of sensory systems in different species.
Literaturempfehlungen	Gilbert S.F., Development, Macmillan Publishers Ltd, 11th edition 2016
Links	
Language of instruction	English
Duration (semesters)	1 Semester
Module frequency	summer term
Module capacity	6 (Reihenfolge der Anmeldungen)
Reference text	associated with bio845 Introduction to Development and Evolution
Type of module	Wahlpflicht / Elective
Module level	MM (Mastermodul / Master module)
Teaching/Learning method	Lecture, exercise, seminar

Examination	Prüfungszeiten	Type of examination
Final exam of module	same summer term	protocol

Form of instruction	Exercises
SWS	6
Frequency	SoSe

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

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

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

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

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

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

neu380 - Neuroethology and Neurogenetics: Insect Models

Module label	Neuroethology and Neurogenetics: Insect Models
Modulkürzel	neu380
Credit points	6.0 KP
Workload	180 h
Verwendbarkeit des Moduls	• Master's Programme Biology (Master) > Background Modules • Master's Programme Neuroscience (Master) > Background Modules
Zuständige Personen	• Albert, Jörg (module responsibility) • Clemens, Jan (Prüfungsberechtigt) • Albert, Jörg (Prüfungsberechtigt) • Albert, Jörg (Module counselling) • Clemens, Jan (Module counselling)
Prerequisites	Enrolment in Master program Neuroscience or Biology, Students from other programs are welcome if space is available Attendance in pre-meeting
Skills to be acquired in this module	**Goals of this module:** upon completion of this module, students… • have knowledge on the emergence of behavior from neurosensory activation • have learned about the interdependdces between signals and their receivers (keyword: matched filters) • have a basic understanding of the multiple determinants of behavior: molecular (e.g. genes), cellular (e.g. neurons), organismic (e.g. individuals), environmental (e.g. noise) and inter-individual (e.g. communication) • have acquired basic skills in data analysis • have acquired basic understanding of sensory signal processing • have acquired an intuitive understanding of the multi-causal nature of behavior and the corresponding multiple levels of investigation **Skills to be acquired/ competencies:** ++ Neuroscience knowledge ++ Experimental Methods + Scientific Literature + Social skills + Maths/Stats/Programming + Independent Research + Data presentation/discussion + Scientific English + Ethics
Module contents	The module consists of three weeks of seminar and hands-on lab exercises on insect behavioral experiments and electrophysiology (extracellular recordings from Drosophila or mosquito neurons). The seminar covers the following topics: • Introduction to Dipteran courtship behaviour (fruit flies and mosquitoes): common mechanisms and principles • The cellular and molecular basis of Dipteran courtship: Between shared evolution and species-specific adaptation • Introduction to the neurophysiological and neurogenetic toolbox to dissect behaviour (optogenetic, biophysical, behavioural) • Introduction to data analysis methods In the practical exercises, portfolio assignments will be performed on: • Quantitative analysis of neural responses (electrophysiology, reporter imaging) from Dipteran insects

- Quantitative analysis of behavioural responses from Dipteran insects (e.g. courtship behaviour, flight tones)
- Design and Testing of different stimuli to probe neural and behavioural responses

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	
Languages of instruction	
Duration (semesters)	1 Semester
Module frequency	annually, summer term, first half
Module capacity	12
Reference text	Recommended combination with neu341 and neu650

Examination	Prüfungszeiten	Type of examination
Final exam of module	During the course (assignment tasks)	Portfolio, consisting of short tests and short reports to portfolio tasks (see above)

Form of instruction	Comment	SWS	Frequency	Workload of compulsory attendance
Seminar		2	SoSe	28 Contact (hours): 28 Self-study and preparation for exam (hours): 44 Total workload (hours): 72
Exercises		3	SoSe	42 Contact (hours): 42 Self-study and preparation (hours): 66 Total workload (hours): 108

Präsenzzeit Modul insgesamt	70 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

bio900 - Biology Research Module

Module label	Biology Research Module
Modulkürzel	bio900
Credit points	15.0 KP
Workload	450 h
Verwendbarkeit des Moduls	• Master's Programme Biology (Master) > Research Modules • Master's Programme Biology (Master) > Research Modules
Zuständige Personen	• Zotz, Gerhard (module responsibility) • Zotz, Gerhard (Prüfungsberechtigt) • der Biologie, Lehrende (Prüfungsberechtigt) • der Biologie, Lehrende (Module counselling)
Prerequisites	
Skills to be acquired in this module	Students will learn to plan, perform and analyse a study in a biological field. Topics will be chosen in close coordination with teaching staff. Depending on the particular project, knowledge in statistics, molecular biology, physiology, modelling, or ethology will be necessary. Results will be related to the current biological literature in a written report and be presented in the seminar of the hosting working group. + 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 in German and English (written and spoken) + teamwork ++ project and time management + statistics & scientific programming
Module contents	The students develop an empirical investigation, carry it out and analyse the results. The students present and discuss their project both orally and in writing
Literaturempfehlungen	
Links	https://uol.de/en/biology/groups-our-research
Language of instruction	English
Duration (semesters)	1 Semester
Module frequency	winter and summer term
Module capacity	unlimited
Reference text	Students can choose between many options of individual projects, offered by the different groups involved in the MScBiology study program. All members of the regular IBU Biology faculty at the University of Oldenburg can act as local supervisor (see list of examinors, https://uol.de/fk5/studium/studiengaenge/pruefungsberechtigte). Please refer to the list of options in Stud.IP and contact potential supervisors directly. Within the Modul bio900 is it possible to take several courses as long as their contents differ substantially. When taking the course group 5.02.960 it is mandatory to choose two courses out of the group A – D.
Type of module	Wahlpflicht / Elective
Module level	MM (Mastermodul / Master module)
Teaching/Learning method	Project-based component

Examination	Prüfungszeiten	Type of examination
Final exam of module		internship report

Form of instruction	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture (optional)			SoSe oder WiSe	0
Seminar		1	SoSe oder WiSe	14

Form of instruction	Comment	SWS	Frequency	Workload of compulsory attendance
Projektorientiertes Modul		10	SoSe und WiSe	140
Präsenzzeit Modul insgesamt				154 h

bio810 - External Research Project

Module label	External Research Project
Modulkürzel	bio810
Credit points	15.0 KP
Workload	450 h
Verwendbarkeit des Moduls	• Master's Programme Biology (Master) > Research Modules • Master's Programme Biology (Master) > Research Modules
Zuständige Personen	• Zotz, Gerhard (module responsibility) • Zotz, Gerhard (Prüfungsberechtigt) • der Biologie, Lehrende (Prüfungsberechtigt)
Prerequisites	External research projects are done on an individual basis. They are supervised by one person from Oldenburg (see list of examinors, https://uol.de/fk5/studium/studiengaenge/pruefungsberechtigte) and a local supervisor at any university or research institution in Germany and abroad. Please contact Gerhard Zotz (Gerhard.zotz@uol.de) for details. See https://uol.de/ibu/studium-und-lehre/fach-master-biology/downloads-und-links/ (Learning Agreement for External Research Module)
Skills to be acquired in this module	++ 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 ++ project and time management ++ statistics & scientific programming 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 in publication format • prepare and present a scientific poster
Module contents	Students are introduced to independent research in a specific area of biology by a scientific working group outside of the regular IBU Biology faculty at the University of Oldenburg (usually a university research institute in Germany or abroad). The content and venue of this module is chosen in close coordination with the Prüfungsausschuss Master Biologie, possibly with consultations of other professors. Course work should cover all parts of a scientific project, i.e. data collection, data analysis and the presentation of the results. Irrespective of the particular venue (universities, research institutes) the student has to report to a professor in Oldenburg in form of a written report and an oral presentation, both in English. Note: • all members of the regular IBU Biology faculty at the University of Oldenburg can act as local supervisor (see list of examinors, https://uol.de/fk5/studium/studiengaenge/pruefungsberechtigte), 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 local supervisor • participation in a joint poster presentation of concurrent research modules is highly recommended.
Literaturempfehlungen	varies with chosen topic
Links	
Language of instruction	English
Duration (semesters)	1 Semester
Module frequency	Summer and winter term
Module capacity	unlimited
Type of module	Wahlpflicht / Elective
Module level	MM (Mastermodul / Master module)
Teaching/Learning method	Project-based component

Examination	Prüfungszeiten	Type of examination

Examination		Prüfungszeiten	Type of examination	
Final exam of module			internship report	
Form of instruction	Comment	SWS	Frequency	Workload of compulsory attendance
Seminar		1	SoSe und WiSe	14
Projektorientiertes Modul		10	SoSe und WiSe	140
Präsenzzeit Modul insgesamt				154 h

bio820 - Research Module Fast Track

Module label		Research Module Fast Track	
Modulkürzel		bio820	
Credit points		15.0 KP	
Workload		450 h	
Verwendbarkeit des Moduls		• Master's Programme Biology (Master) > Research Modules • Master's Programme Biology (Master) > Research Modules	
Zuständige Personen		• Klump, Georg Martin (module responsibility) • Klump, Georg Martin (Prüfungsberechtigt)	
Prerequisites			
Skills to be acquired in this module		[nop] ++ 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 in German and English (written and spoken) + teamwork ++ project and time management ++ statistics & scientific programming [/nop]	
Module contents			
Literaturempfehlungen			
Links			
Language of instruction		English	
Duration (semesters)		1 Semester	
Module frequency		irregular	
Module capacity		unlimited	
Type of module		Wahlpflicht / Elective	
Module level		MM (Mastermodul / Master module)	
Teaching/Learning method		Project-based component	
Examination	Prüfungszeiten		Type of examination
Final exam of module			internship report
Form of instruction	Seminar		
SWS	1		
Frequency	--		

Skills Modules

bio870 - Communicating Plant Sciences

Module label	Communicating Plant Sciences
Modulkürzel	bio870
Credit points	6.0 KP
Workload	180 h
Verwendbarkeit des Moduls	• Master's Programme Biology (Master) > Skills Modules • Master's Programme Biology (Master) > Skills Modules
Zuständige Personen	• Zotz, Gerhard (module responsibility) • Albach, Dirk Carl (Module counselling) • Schmaljohann, Heiko (Module counselling) • Zotz, Gerhard (Prüfungsberechtigt) • Albach, Dirk Carl (Prüfungsberechtigt) • Schmaljohann, Heiko (Prüfungsberechtigt) • Nolte, Arne (Prüfungsberechtigt) • Will, Maria (Prüfungsberechtigt)
Prerequisites	
Skills to be acquired in this module	Communicating and practicing scientific presentation techniques (talk, publication, poster) Presentation of data and discussion in spoken and written (english) Communicating of techniques in problem treatment in free speech and scientific writing Independent investigation and knowledge of scientific primary literature + interdisciplinary thinking ++ critical and analytical thinking ++ independent searching and knowledge of scientific literature ++ data presentation and discussion (written and spoken)
Module contents	S: Working group seminar (2 SWS; Choice 1: Functional Ecology; Choice 2: Evolutionary genetics of plants; Choice 3: Plant biodiversity and evolution) S: Scientific Writing in Plant Science (2SWS)
Literaturempfehlungen	
Links	
Language of instruction	English
Duration (semesters)	1 Semester
Module frequency	annually, winter term
Module capacity	12
Type of module	Wahlmodul / Opportunity
Module level	MM (Mastermodul / Master module)
Teaching/Learning method	Seminar

Examination	Prüfungszeiten	Type of examination
Final exam of module		1 term paper

Form of instruction	Seminar
SWS	4
Frequency	WiSe

bio880 - Skills in Plant Systematics

Module label	Skills in Plant Systematics
Modulkürzel	bio880
Credit points	6.0 KP
Workload	180 h
Verwendbarkeit des Moduls	• Master's Programme Biology (Master) > Skills Modules • Master's Programme Biology (Master) > Skills Modules
Zuständige Personen	• Albach, Dirk Carl (module responsibility) • von Hagen, Klaus Bernhard (Module counselling) • Albach, Dirk Carl (Prüfungsberechtigt) • von Hagen, Klaus Bernhard (Prüfungsberechtigt) • Khan, Gulzar (Prüfungsberechtigt)
Prerequisites	
Skills to be acquired in this module	In this module, we provide the skills necessary to describe and distinguish species for floras and monographs/first publication of species. For that, an overview over the plant kingdom is provided. Further, various non-molecular methods of systematics are practiced, such as morphometry, SEM, identification key generation, nomenclature, species delimitation methods, and interpretation of phylogenetic analyses. + 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 (E) (written and spoken) + teamwork + statistics & scientific programming
Module contents	In the seminar we provide an overview over the larger groups of plants and characters for their grouping. We analyse methods for phylogeny generation, angiosperm classification and description of new taxa. In the exercises morphological characters are investigated in various ways and internet resources for further morphological characters presented. Species delimitation methods for molecular and morphological characters are used. Identification keys are generated and nomenclatural rules discussed.
Literaturempfehlungen	
Links	
Language of instruction	English
Duration (semesters)	1 Semester
Module frequency	Winter term
Module capacity	8
Type of module	Wahlmodul / Opportunity
Module level	MM (Mastermodul / Master module)
Teaching/Learning method	Seminar, exercise
Previous knowledge	Good knowledge of native flora

Examination	Prüfungszeiten	Type of examination
Final exam of module		2 examinations: 1 presentation (50%); 1 report (50%)

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

bio890 - Current Topics in Biology

Module label	Current Topics in Biology
Modulkürzel	bio890
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 Landscape Ecology (Master) > Wahlpflichtmodule
Zuständige Personen	• Gerlach, Gabriele (module responsibility) • Gerlach, Gabriele (Prüfungsberechtigt) • Laakmann, Silke (Prüfungsberechtigt) • Beutelmann, Rainer (Prüfungsberechtigt)
Prerequisites	
Skills to be acquired in this module	+ biological knowledge + biologically relevant, natural / mathematical scientific basic knowledge ++ interdisciplinary knowledge and thinking ++ abstract, logical, and analytical thinking ++ expanded knowledge in a specific biological field ++ presentation of results and factual discussion, both written and spoken ++ (scientific) communication skills To develop skills in the critical analysis and interpretation of results and themes in diverse areas of modern biology, including (but not limited to) evolutionary biology, population genetics, biodiversity, ecology, genomics, ornithology, and neurobiology.
Module contents	Discussion and interpretations of one or more themes in modern biology. The themes and exact content will be provided by the instructor(s) at the beginning of the course. The module bio890 may be taken more than once as long as the content covered in the seminars differ substantially.
Literaturempfehlungen	Varies with chosen topic (will be provided by the instructor(s) at the beginning of the course)
Links	
Language of instruction	English
Duration (semesters)	1 Semester
Module frequency	Summer and winter term
Module capacity	unlimited
Type of module	Wahlmodul / Opportunity
Module level	MM (Mastermodul / Master module)
Teaching/Learning method	Seminar

Examination	Prüfungszeiten	Type of examination
Final exam of module	open	Final exam of module: 1 Portfolio. Components vary in the seminars. They are specified in Stud.IP in the respective seminar.

Form of instruction	Seminar
SWS	2
Frequency	SoSe und WiSe

bio777 - Objekte in wissenschaftlichen Sammlungen: Konservierung, Management und Forschungsfragen

Module label	Objekte in wissenschaftlichen Sammlungen: Konservierung, Management und Forschungsfragen
Modulkürzel	bio777
Credit points	6.0 KP
Workload	180 h
Verwendbarkeit des Moduls	• Master's Programme Biology (Master) > Skills Modules • Master's Programme Biology (Master) > Skills Modules
Zuständige Personen	• Will, Maria (module responsibility) • Albach, Dirk Carl (Module counselling) • von Lindern, Klara (Module counselling) • Will, Maria (Prüfungsberechtigt) • von Lindern, Klara (Prüfungsberechtigt)
Prerequisites	
Skills to be acquired in this module	+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 +data presentation and discussion (written and spoken) +teamwork ++ethics and professional behaviour ++project and time management
Module contents	- history of collections at universities and their importance for developing scientific theories; - origin/formation of collections (objects in time and space) - the collections of the CvO (overview) and their importance as infrastructure for teaching, learning and research - collection work in biological collections such as botanical garden, natural history museums, didactical collections or the herbarium (concepts, object handling, conservation, documentation & digitalization) - developing research questions and projects based on objects/collections, e.g., provenance research - communicating object-based topics (e.g., speed talk presenting current scientifc articles)
Literaturempfehlungen	articles and book chapters referring to (1) the history/presence/future of collections, (2) collection management and (3) research projects based on objects/collections
Links	https://uol.de/kustodien/zertifikatsprogramm
Languages of instruction	German, English
Duration (semesters)	1 Semester
Module frequency	Winter term
Module capacity	10 (Lecture & seminar as a transdisciplinary course in cooperation with Fak. III)

Reference text	Linked to the module bio783 "Object-based Research Projects in Biological Collections" (can be taken independently). Due to overlapping content, the module cannot be taken in addition to pb335.
Type of module	Wahlmodul / Opportunity
Module level	MM (Mastermodul / Master module)
Teaching/Learning method	Lecture, seminar, exercise

Examination	Prüfungszeiten	Type of examination
Final exam of module		2 examinations: - 1 written exam or 1 oral exam (100%) AND 1 practical exercise (ungraded)

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

bio783 - Object-based Research Projects in Biological Collections

Module label	Object-based Research Projects in Biological Collections
Modulkürzel	bio783
Credit points	6.0 KP
Workload	180 h
Verwendbarkeit des Moduls	• Master's Programme Biology (Master) > Skills Modules • Master's Programme Biology (Master) > Skills Modules
Zuständige Personen	• Will, Maria (module responsibility) • Albach, Dirk Carl (Module counselling) • Will, Maria (Prüfungsberechtigt)
Prerequisites	
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 ++ability to perform independent biological research ++data presentation and discussion in German and English (written and spoken) +teamwork +ethics and professional behaviour ++project and time management
Module contents	- documentation of a natural history collection (e.g., university or from an herbarium) including a description of the object(s), digitalization, check for traces of use and/or damage; - if needed: restauration, i.e. fixing loose plants on herbarium vouchers; - trace biographies of the collector and the collection/object (provenance); - trace comparable collections using databases; - as far as possible: identification/validation of scientific identification using databases and scientific literature - generating and answer scientific questions based on the collection or develop an educational approach (e.g., teaching lecture) - communicate the results, i.e. prepare a poster for a congress and defend your theses and summarize the results in a manuscripts
Literaturempfehlungen	scientific literature corresponding to the individual research project
Links	
Languages of instruction	German, English
Duration (semesters)	1 Semester
Module frequency	irregular
Module capacity	4
Reference text	Linked to the module bio777 "Objects in scientific collections: Conservation, management and research issues' (independent allocation possible). The competences overlap with pb336. If module pb336 has been completed previously, admission to the module will be decided on an individual basis.
Type of module	Wahlmodul / Opportunity
Module level	MM (Mastermodul / Master module)
Teaching/Learning method	Exercise

Examination	Prüfungszeiten	Type of examination
Final exam of module	individual	1 Portfolio

Form of instruction	Exercises
SWS	4
Frequency	WiSe

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

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

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

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

neu820 - Neuroscience Journal Club

Module label	Neuroscience Journal Club
Modulkürzel	neu820
Credit points	3.0 KP
Workload	90 h (30h contact / 60h reading and preparation of oral and poster presentation)
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	• Mertsch, Sonja (module responsibility) • Mertsch, Sonja (Prüfungsberechtigt)
Prerequisites	
Skills to be acquired in this module	Students will learn to read, interpret, present and discuss neuroscientific literature. ++ Neurosci. knowledge + Expt. Methods ++ Scient. Literature ++ Social skills + Interdiscipl. knowledge ++ Data present./disc. + Scientific English + Ehtics
Module contents	Week 1: How to read and present a scientific paper and how to generate a scientific poster? Distribution of papers to participants Week 2: Example presentation of a scientific paper by the teacher with discussion Week 3-13: Oral presentation / moderation of discussion of one scientific paper per week by one or two student(s) Week 14: Short poster presentations of all students The focus topic of the scientific literature will change between semesters. In winter semester 2021/22, the topic will be regenerative ophthalmology with the focus on tissue engineering.
Literaturempfehlungen	Scientific literature will be available in Stud.IP
Links	
Language of instruction	English
Duration (semesters)	1 Semester
Module frequency	winter term, annually
Module capacity	20

Examination	Prüfungszeiten	Type of examination
Final exam of module	during the semester	presentation and attandance of at least 70% in the seminars

Form of instruction	Seminar
SWS	2
Frequency	SoSe und WiSe

neu725 - Multivariate Statistics and Applications in R

Module label	Multivariate Statistics and Applications in R
Modulkürzel	neu725
Credit points	6.0 KP
Workload	180 h (2 SWS Lecture (30h contact / 60h self-studies and exam preparation) 2 SWS Seminar (30h contact / 60h statistical data analysis in R))
Verwendbarkeit des Moduls	• Master's Programme Biology (Master) > Skills Modules • Master's Programme Neuroscience (Master) > Skills Modules
Zuständige Personen	• Hildebrandt, Andrea (module responsibility) • Hildebrandt, Andrea (Prüfungsberechtigt)
Prerequisites	recommended in semester 1/3 weeks 11-13 of summer semester
Skills to be acquired in this module	Students will acquire basic knowledge in planning empirical investigations, managing and understanding quantitative data and conducting a wide variety of multivariate statistical analyses. They will learn how to use the statistical methodology in terms of good scientific practice and how to interpret, evaluate and synthesize empirical results from the perspective of statistical modeling in basic and applied research context. The courses in this module will additionally point out statistical misconceptions and help students to overcome them. + Independent research + Scient. Literature + Social skills ++ Interdiscipl. knowledge ++ Maths/Stats/Progr. ++ Data preset./disc. + Scient. English ++ Ethics
Module contents	Part 1: Multivariate Statistics I (lecture): Graphical representation of multivariate data The Generalized Linear Modeling (GLM) framework Multiple and moderated linear regression with quantitative and qualitative predictors Logistic regression Multilevel regression (Generalized Linear Mixed Effects Modeling – GLMM) Non-linear regression models Path modeling Factor analysis (exploratory & confirmatory) (Multilevel) Structural equation modeling (SEM linear and non-linear) Part 2: Analysis Methods with R (seminar) Data examples and applications of GLM, GLMM, polynomial, spline and local regression, path modeling, factor analyses and SEM
Literaturempfehlungen	Course material will be available in Stud.IP
Links	
Language of instruction	English
Duration (semesters)	1 Semester
Module frequency	winter term, annually
Module capacity	unlimited (recommended in semester 1/3 weeks 11-13 of summer semester)

Examination	Prüfungszeiten	Type of examination
Final exam of module	End of winter semester	written exam attendance of at least 70% in the seminars (in addition, mandatory but ungraded)

Form of instruction	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		2	SoSe oder WiSe	28

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

Abschlussmodul

mam - Master´s Thesis Module

Module label		Master´s Thesis Module	
Modulkürzel		mam	
Credit points		30.0 KP	
Workload		900 h	
Verwendbarkeit des Moduls		• Master's Programme Biology (Master) > Abschlussmodul	
Zuständige Personen		• der Biologie, Lehrende (Prüfungsberechtigt)	
Prerequisites		see examination regulations Faculty V and subject-specific annex, §20 https://uol.de/en/course-of-study/exams/biology-master-614	
Skills to be acquired in this module		Successful completion of the Master module demonstrates that students are able to work on a problem in the field of Biology within a fixed period applying scientific methods. ++ 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 in German and English (written and spoken) + teamwork + ethics and professional behaviour ++ project and time management	
Module contents		Preparing the Master thesis Active participation in the seminar of the research group, in which the Master thesis is written	
Literaturempfehlungen		Supervisors may supply an initial reading list with important literature. The students are expected to find and use further literature as needed.	
Links			
Language of instruction		English	
Duration (semesters)		1 Semester	
Module frequency		semiannual	
Module capacity		unlimited	
Type of module		Pflicht / Mandatory	
Module level		Abschlussmodul (Abschlussmodul / Conclude)	
Teaching/Learning method		master's thesis, seminar	
Examination	Prüfungszeiten		Type of examination
Final exam of module			master's thesis (90%) Final colloquium (10%)
Form of instruction	Colloquium		
SWS	2		
Frequency	SoSe oder WiSe		