

## Background Modules

### bio703 - Basic Concepts in Plant Sciences

<b>Module label</b>	Basic Concepts in Plant Sciences
<b>Module code</b>	bio703
<b>Credit points</b>	12.0 KP
<b>Workload</b>	360 h
<b>Applicability of the module</b>	<ul style="list-style-type: none"> <li>• Master's Programme Biology (Master) &gt; Background Modules</li> <li>• Master's Programme Biology (Master) &gt; Background Modules</li> <li>• Master's Programme Landscape Ecology (Master) &gt; Wahlpflichtmodule</li> </ul>
<b>Responsible persons</b>	<ul style="list-style-type: none"> <li>• Zotz, Gerhard (module responsibility)</li> <li>• Albach, Dirk Carl (Module counselling)</li> <li>• von Hagen, Klaus Bernhard (Module counselling)</li> <li>• Zotz, Gerhard (authorised to take exams)</li> <li>• Albach, Dirk Carl (authorised to take exams)</li> <li>• von Hagen, Klaus Bernhard (authorised to take exams)</li> <li>• Will, Maria (authorised to take exams)</li> </ul>
<b>Prerequisites</b>	
<b>Skills to be acquired in this module</b>	<p>Communicating in-depth knowledge in ecology, phylogeny, evolution and genetics of plants. Practicing an approach to scientific questions that considers different scales and methodologies Communicating theoretical concepts of ecology, evolution and genetics of plants.</p> <p>++ in-depth biological expertise            + in-depth 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</p>
<b>Module contents</b>	<p>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)</p>
<b>Recommended reading</b>	<p>Bresinsky et al. Strasburger's Plant Sciences. 2013 Springer, available as ebook. Oliveira, R.S. 2019. Plant Physiological Ecology. New York: Springer, available as ebook</p>
<b>Links</b>	
<b>Language of instruction</b>	English
<b>Duration (semesters)</b>	1 Semester
<b>Module frequency</b>	annually, winter term
<b>Module capacity</b>	12
<b>Reference text</b>	<p>associated with bio765 (Current Methods in Plant Science) (recommended)</p>
<b>Type of module</b>	Wahlpflicht / Elective

<b>Module level</b>	MM (Mastermodul / Master module)	
<b>Teaching/Learning method</b>	Lecture, seminar	
<b>Previous knowledge</b>	Ecology, flora, genetics	
<b>Examination</b>	Prüfungszeiten	Type of examination
<b>Final exam of module</b>	1 Portfolio	

Type of course	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		4	WiSe	56
Seminar		4	WiSe	56
<b>Total module attendance time</b>				112 h

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

<b>Module label</b>	Current Methods in Plant Sciences - Ecology, Phylogeny and Molecular Biology
<b>Module code</b>	bio765
<b>Credit points</b>	12.0 KP
<b>Workload</b>	360 h
<b>Applicability of the module</b>	<ul style="list-style-type: none"><li>• Master's Programme Biology (Master) &gt; Background Modules</li><li>• Master's Programme Biology (Master) &gt; Background Modules</li><li>• Master's Programme Landscape Ecology (Master) &gt; Wahlpflichtmodule</li></ul>
<b>Responsible persons</b>	<ul style="list-style-type: none"><li>• Albach, Dirk Carl (module responsibility)</li><li>• Zotz, Gerhard (Module counselling)</li><li>• Will, Maria (Module counselling)</li><li>• Khan, Gulzar (Module counselling)</li><li>• von Hagen, Klaus Bernhard (Module counselling)</li><li>• Zotz, Gerhard (authorised to take exams)</li><li>• Will, Maria (authorised to take exams)</li><li>• Albach, Dirk Carl (authorised to take exams)</li><li>• Khan, Gulzar (authorised to take exams)</li><li>• von Hagen, Klaus Bernhard (authorised to take exams)</li></ul>
<b>Prerequisites</b>	
<b>Skills to be acquired in this module</b>	<p>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</p> <p>++ in-depth biological expertise ++ in-depth 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 &amp; scientific programming</p>
<b>Module contents</b>	<p>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: <a href="https://elearning.uni-oldenburg.de/dispatch.php/course/details?sem_id=d35edd08df0fb5c6a8ae3a81ea738b88&amp;again=yes">https://elearning.uni-oldenburg.de/dispatch.php/course/details?sem_id=d35edd08df0fb5c6a8ae3a81ea738b88&amp;again=yes</a></p>
<b>Recommended reading</b>	
<b>Links</b>	
<b>Language of instruction</b>	English
<b>Duration (semesters)</b>	1 Semester
<b>Module frequency</b>	annually, winter term
<b>Module capacity</b>	12
<b>Reference text</b>	associated with bio703 (Basic Concepts in Plant Sciences) (recommended)
<b>Type of module</b>	Wahlpflicht / Elective
<b>Module level</b>	MM (Mastermodul / Master module)
<b>Teaching/Learning method</b>	Exercise

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**Previous knowledge**

Ecology, flora, genetics

Examination

Prüfungszeiten

Type of examination

**Final exam of module**

**1 portfolio (1 poster, 1  
short report, 1 report)**

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**Type of course**

Exercises

**SWS**

8

**Frequency**

WiSe

**Workload attendance time**

112 h

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## bio655 - Ornithology in theoretical Concepts

<b>Module label</b>	Ornithology in theoretical Concepts
<b>Module code</b>	bio655
<b>Credit points</b>	12.0 KP
<b>Workload</b>	360 h
<b>Applicability of the module</b>	<ul style="list-style-type: none"><li>• Master's Programme Biology (Master) &gt; Background Modules</li><li>• Master's Programme Biology (Master) &gt; Background Modules</li></ul>
<b>Responsible persons</b>	<ul style="list-style-type: none"><li>• Liedvogel, Miriam (module responsibility)</li><li>• Bouwhuis, Sandra (Module counselling)</li><li>• Köppl, Christine (Module counselling)</li><li>• Langemann, Ulrike (Module counselling)</li><li>• Mouritsen, Henrik (Module counselling)</li><li>• Schmaljohann, Heiko (Module counselling)</li><li>• Heim, Wieland (Module counselling)</li><li>• Köppl, Christine (authorised to take exams)</li><li>• Liedvogel, Miriam (authorised to take exams)</li><li>• Bouwhuis, Sandra (authorised to take exams)</li><li>• Langemann, Ulrike (authorised to take exams)</li><li>• Mouritsen, Henrik (authorised to take exams)</li><li>• Schmaljohann, Heiko (authorised to take exams)</li><li>• Heim, Wieland (authorised to take exams)</li></ul>

### 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)

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### 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 study and 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.

### Recommended reading

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

Participating Institution: Institute of Avian Research für Vogelforschung

<http://www.ifv-vogelwarte.de> <https://ifv-vogelwarte.de/en/home>

<b>Language of instruction</b>	English			
<b>Duration (semesters)</b>	1 Semester			
<b>Module frequency</b>	winter term			
<b>Module capacity</b>	30			
<b>Reference text</b>	associated with bio663			
<b>Type of module</b>	Wahlpflicht / Elective			
<b>Module level</b>	MM (Mastermodul / Master module)			
<b>Teaching/Learning method</b>	Lecture, seminar			
Examination	Prüfungszeiten	Type of examination		
<b>Final exam of module</b>	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.		
Type of course	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		4	WiSe	56
Seminar		4	WiSe	56

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Type of course	Comment	SWS	Frequency	Workload of compulsory attendance
<b>Total module attendance time</b>				112 h

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## bio770 - Field Methods in Organismal Biology

<b>Module label</b>	Field Methods in Organismal Biology
<b>Module code</b>	bio770
<b>Credit points</b>	15.0 KP
<b>Workload</b>	450 h
<b>Applicability of the module</b>	<ul style="list-style-type: none"><li>• Master's Programme Biology (Master) &gt; Background Modules</li><li>• Master's Programme Biology (Master) &gt; Background Modules</li><li>• Master's Programme Landscape Ecology (Master) &gt; Wahlpflichtmodule</li></ul>
<b>Responsible persons</b>	<ul style="list-style-type: none"><li>• Zotz, Gerhard (module responsibility)</li><li>• Gerlach, Gabriele (Module counselling)</li><li>• Albach, Dirk Carl (Module counselling)</li><li>• von Hagen, Klaus Bernhard (Module counselling)</li><li>• Mouritsen, Henrik (Module counselling)</li><li>• Nolte, Arne (Module counselling)</li><li>• Schmaljohann, Heiko (Module counselling)</li><li>• Zotz, Gerhard (authorised to take exams)</li><li>• Gerlach, Gabriele (authorised to take exams)</li><li>• Albach, Dirk Carl (authorised to take exams)</li><li>• Will, Maria (authorised to take exams)</li><li>• von Hagen, Klaus Bernhard (authorised to take exams)</li><li>• Mouritsen, Henrik (authorised to take exams)</li><li>• Nolte, Arne (authorised to take exams)</li><li>• Khan, Gulzar (authorised to take exams)</li><li>• Schmaljohann, Heiko (authorised to take exams)</li></ul>
<b>Prerequisites</b>	
<b>Skills to be acquired in this module</b>	<p>++ in-depth biological expertise ++ in-depth 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 &amp; scientific programming</p> <p>The module 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).</p>
<b>Module contents</b>	<p>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</p>
<b>Recommended reading</b>	Varies with topic and venue
<b>Links</b>	<a href="http://www.uni-oldenburg.de/fun_eco/">www.uni-oldenburg.de/fun_eco/</a>
<b>Language of instruction</b>	English
<b>Duration (semesters)</b>	1 Semester



<b>Module frequency</b>	annually in summer term
<b>Module capacity</b>	21
<b>Type of module</b>	Wahlpflicht / Elective
<b>Module level</b>	MM (Mastermodul / Master module)
<b>Teaching/Learning method</b>	Seminar, exercise

Examination	Prüfungszeiten	Type of examination
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**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.

Type of course	Comment	SWS	Frequency	Workload of compulsory attendance
Exercises		10	SuSe	140
Seminar		2	SuSe	28
Seminar (Pflichtveranstaltung für Erstsemester OHNE bisherige Belehrung)			WiSe	0
<b>Total module attendance time</b>				<b>168 h</b>

## bio720 - Marine Biodiversity

<b>Module label</b>	Marine Biodiversity			
<b>Module code</b>	bio720			
<b>Credit points</b>	15.0 KP			
<b>Workload</b>	450 h			
<b>Applicability of the module</b>	<ul style="list-style-type: none"> <li>• Master's Programme Biology (Master) &gt; Background Modules</li> <li>• Master's Programme Biology (Master) &gt; Background Modules</li> </ul>			
<b>Responsible persons</b>	<ul style="list-style-type: none"> <li>• Martinez Arbizu, Pedro Miguel (module responsibility)</li> <li>• Martinez Arbizu, Pedro Miguel (authorised to take exams)</li> <li>• Wehrmann, Achim (authorised to take exams)</li> <li>• Rossel, Sven (authorised to take exams)</li> <li>• Gutt, Julian (authorised to take exams)</li> <li>• Kröncke, Ingrid (authorised to take exams)</li> </ul>			
<b>Prerequisites</b>				
<b>Skills to be acquired in this module</b>	<p>++ deepened biological expertise          ++ deepened knowledge of biological working methods          ++ data analysis skills          ++ interdisciplinary thinking          ++ critical and analytical thinking          ++ independent searching and knowledge of scientific literature          ++ ability to perform independent biological research          ++ data presentation and discussion (written and spoken) (E)          ++ teamwork          + ethics and professional behaviour          + project and time management          ++ statistics &amp; scientific programming</p> <p>Knowledge of fundamentals, topical subjects and methods in Marine Biology and Marine Geology. Studies and critical assessment of the scientific literature.</p>			
<b>Module contents</b>	<p>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.</p>			
<b>Recommended reading</b>	as announced in the lecture			
<b>Links</b>				
<b>Languages of instruction</b>	English , German			
<b>Duration (semesters)</b>	1 Semester			
<b>Module frequency</b>	winter term			
<b>Module capacity</b>	unlimited			
<b>Type of module</b>	Wahlpflicht / Elective			
<b>Module level</b>	MM (Mastermodul / Master module)			
<b>Teaching/Learning method</b>	Lecture, seminar, exercise			
Examination	Prüfungszeiten	Type of examination		
<b>Final exam of module</b>		<p>Written examination (60 %), short presentation (20%), practical exercise (20%)          Regular active participation is required for the module to be passed.</p>		
Type of course	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		3	WiSe	42
Exercises		9	WiSe	126
Seminar		1	WiSe	14
<b>Total module attendance time</b>				182 h

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## bio780 - Biodiversity of Littoral Communities

<b>Module label</b>	Biodiversity of Littoral Communities
<b>Module code</b>	bio780
<b>Credit points</b>	15.0 KP
<b>Workload</b>	450 h
<b>Applicability of the module</b>	<ul style="list-style-type: none"><li>• Master's Programme Biology (Master) &gt; Background Modules</li><li>• Master's Programme Biology (Master) &gt; Background Modules</li></ul>
<b>Responsible persons</b>	<ul style="list-style-type: none"><li>• Martinez Arbizu, Pedro Miguel (module responsibility)</li><li>• Martinez Arbizu, Pedro Miguel (authorised to take exams)</li></ul>
<b>Prerequisites</b>	Safe apnoeiving with aptitude test and medical fitness certificate
<b>Skills to be acquired in this module</b>	<p>+ deepened knowledge of biological working methods + ability to perform independent biological research ++ teamwork + ethics and professional behaviour + project and time management</p> <p>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 apnoeiving - Measures in case of accidents (also caused by "poisonous" organisms)</p>
<b>Module contents</b>	Biodiversity of littoral biotic communities – topographical field research
<b>Recommended reading</b>	<p>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. &amp; 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. &amp; 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. &amp; M. D. MERTNESS, 2005: Marine Biology - An ecological approach. Pearson,</p>

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](http://www.bis.uni-oldenburg.de) – Data banks(DBIS) – Biology – TOP data banks, e.g. ASFA, Science Citation Index, Zoological Record <http://www.biodiversitylibrary.org/bibliography/14107> [externhttp://scholar.google.de/](http://scholar.google.de/) [externhttp://www.vifabio.de](http://www.vifabio.de) Open access journals: [externhttp://www.doaj.org/](http://www.doaj.org/) - [externhttp://www.plosone.org](http://www.plosone.org)

<b>Links</b>		
<b>Language of instruction</b>	English	
<b>Duration (semesters)</b>	1 Semester	
<b>Module frequency</b>	annually in summer term	
<b>Module capacity</b>	unlimited	
<b>Type of module</b>	Wahlpflicht / Elective	
<b>Module level</b>	MM (Mastermodul / Master module)	
<b>Teaching/Learning method</b>	Exercise, seminar	
Examination	Prüfungszeiten	Type of examination
<b>Final exam of module</b>	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.

Type of course	Comment	SWS	Frequency	Workload of compulsory attendance
Exercises		9	SuSe	126
Seminar		3	SuSe	42
Seminar (Pflichtveranstaltung für Erstsemester OHNE bisherige Belehrung)			WiSe	0
<b>Total module attendance time</b>				<b>168 h</b>

## bio733 - Evolutionary Biology Population Genetics

<b>Module label</b>	Evolutionary Biology Population Genetics	
<b>Module code</b>	bio733	
<b>Credit points</b>	6.0 KP	
<b>Workload</b>	180 h	
<b>Applicability of the module</b>	<ul style="list-style-type: none"> <li>• Master's Programme Biology (Master) &gt; Background Modules</li> <li>• Master's Programme Biology (Master) &gt; Background Modules</li> </ul>	
<b>Responsible persons</b>	<ul style="list-style-type: none"> <li>• Gerlach, Gabriele (module responsibility)</li> <li>• Albach, Dirk Carl (Module counselling)</li> <li>• Khan, Gulzar (Module counselling)</li> <li>• Gerlach, Gabriele (authorised to take exams)</li> <li>• Albach, Dirk Carl (authorised to take exams)</li> <li>• Khan, Gulzar (authorised to take exams)</li> </ul>	
<b>Further responsible persons</b>	Levent Khan	
<b>Prerequisites</b>	none	
<b>Skills to be acquired in this module</b>	<ul style="list-style-type: none"> <li>+ deepened biological expertise</li> <li>++ deepened knowledge of biological working methods</li> <li>++ data analysis skills</li> <li>++ critical and analytical thinking</li> <li>++ independent searching and knowledge of scientific literature</li> <li>++ data presentation and discussion (E) (written and spoken)</li> <li>+ teamwork</li> <li>++ statistics &amp; scientific programming</li> </ul>	
<b>Module contents</b>	<p>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 determine distribution and genetic exchange between populations</p>	
<b>Recommended reading</b>	<p>current papers in Evolutionary Biology Futuyama D. Evolutionary Biology, Elsevier, Hartl &amp; Clark Principles of Population Genetics, Sinauer</p>	
<b>Links</b>		
<b>Language of instruction</b>	English	
<b>Duration (semesters)</b>	1 Semester	
<b>Module frequency</b>	winter term	
<b>Module capacity</b>	12	
<b>Reference text</b>	<p>associated with bio736 (Evolutionary Transcriptomics) (recommended)</p>	
<b>Type of module</b>	Wahlpflicht / Elective	
<b>Module level</b>	MM (Mastermodul / Master module)	
<b>Teaching/Learning method</b>	Lecture, exercise	
<b>Previous knowledge</b>	Basic knowledge of evolutionary biology	
<b>Examination</b>	Prüfungszeiten	Type of examination

Examination	Prüfungszeiten	Type of examination
<b>Final exam of module</b>		portfolio (presentation, laboratory protocol)

Type of course	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		1	WiSe	14
Exercises		3	WiSe	42
<b>Total module attendance time</b>				<b>56 h</b>

## bio736 - Evolutionary Transcriptomics

<b>Module label</b>	Evolutionary Transcriptomics	
<b>Module code</b>	bio736	
<b>Credit points</b>	6.0 KP	
<b>Workload</b>	180 h	
<b>Applicability of the module</b>	<ul style="list-style-type: none"> <li>• Master's Programme Biology (Master) &gt; Background Modules</li> <li>• Master's Programme Biology (Master) &gt; Background Modules</li> </ul>	
<b>Responsible persons</b>	<ul style="list-style-type: none"> <li>• Nolte, Arne (module responsibility)</li> <li>• Dennenmoser, Stefan (Module counselling)</li> <li>• Nolte, Arne (authorised to take exams)</li> <li>• Dennenmoser, Stefan (authorised to take exams)</li> </ul>	
<b>Prerequisites</b>	none	
<b>Skills to be acquired in this module</b>	<ul style="list-style-type: none"> <li>+ deepened biological expertise</li> <li>++ deepened knowledge of biological working methods</li> <li>++ data analysis skills;</li> <li>++ critical and analytical thinking</li> <li>+ independent searching and knowledge of scientific literature</li> <li>++ data presentation and discussion in English (written and spoken)</li> <li>++ statistics &amp; scientific programming</li> </ul>	
<b>Module contents</b>	<p>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.</p>	
<b>Recommended reading</b>		
<b>Links</b>		
<b>Language of instruction</b>	English	
<b>Duration (semesters)</b>	1 Semester	
<b>Module frequency</b>	winter term	
<b>Module capacity</b>	12	
<b>Reference text</b>	<p>associated with bio733: Evolutionary Biology Population Genetics (recommended)</p>	
<b>Type of module</b>	Wahlpflicht / Elective	
<b>Module level</b>	MM (Mastermodul / Master module)	
<b>Teaching/Learning method</b>	Lecture, exercise	
<b>Previous knowledge</b>	Basic knowledge of evolutionary biology	
<b>Examination</b>	Prüfungszeiten	Type of examination
<b>Final exam of module</b>	portfolio (presentation, laboratory protocol)	

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Type of course	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		1	WiSe	14
Exercises		3	WiSe	42
<b>Total module attendance time</b>				<b>56 h</b>



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## bio675 - Molecular Ecology

<b>Module label</b>	Molecular Ecology
<b>Module code</b>	bio675
<b>Credit points</b>	12.0 KP
<b>Workload</b>	360 h
<b>Applicability of the module</b>	<ul style="list-style-type: none"><li>• Master's Programme Biology (Master) &gt; Background Modules</li><li>• Master's Programme Biology (Master) &gt; Background Modules</li><li>• Master's Programme Landscape Ecology (Master) &gt; Wahlpflichtmodule</li></ul>
<b>Responsible persons</b>	<ul style="list-style-type: none"><li>• Nolte, Arne (module responsibility)</li><li>• Gerlach, Gabriele (Module counselling)</li><li>• Nolte, Arne (authorised to take exams)</li><li>• Gerlach, Gabriele (authorised to take exams)</li><li>• Dennermoser, Stefan (authorised to take exams)</li></ul>
<b>Prerequisites</b>	
<b>Skills to be acquired in this module</b>	<p>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.</p> <ul style="list-style-type: none"><li>++ deepened biological expertise</li><li>++ deepened knowledge of biological working methods</li><li>++ data analysis skills</li><li>+ interdisciplinary thinking</li><li>+ critical and analytical thinking</li><li>+ independent searching and knowledge of scientific literature</li><li>++ ability to perform independent biological research</li><li>++ data presentation and discussion (E) (written and spoken)</li><li>+ statistics &amp; scientific programming</li></ul>
<b>Module contents</b>	<p>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. Exercise: 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.</p>
<b>Recommended reading</b>	will be announced during the course
<b>Links</b>	
<b>Language of instruction</b>	English
<b>Duration (semesters)</b>	1 Semester
<b>Module frequency</b>	summer term
<b>Module capacity</b>	15
<b>Reference text</b>	associated with bio890 Current Topics of Biology (Seminar)
<b>Type of module</b>	Wahlpflicht / Elective

<b>Module level</b>	MM (Mastermodul / Master module)			
<b>Teaching/Learning method</b>	Lecture, Exercise			
<b>Previous knowledge</b>	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		
<b>Final exam of module</b>	during the module	<b>Portfolio (Presentation, research proposal)</b>		
Type of course	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		2	SuSe	28
Exercises		6	SuSe	84
<b>Total module attendance time</b>				112 h

## bio605 - Molecular Genetics and Cell Biology

<b>Module label</b>	Molecular Genetics and Cell Biology		
<b>Module code</b>	bio605		
<b>Credit points</b>	12.0 KP		
<b>Workload</b>	360 h		
<b>Applicability of the module</b>	<ul style="list-style-type: none"> <li>• Master's Programme Biology (Master) &gt; Background Modules</li> <li>• Master's Programme Biology (Master) &gt; Background Modules</li> <li>• Master's Programme Molecular Biomedicine (Master) &gt; Background Modules</li> <li>• Master's Programme Neuroscience (Master) &gt; Background Modules</li> </ul>		
<b>Responsible persons</b>	<ul style="list-style-type: none"> <li>• Neidhardt, John (module responsibility)</li> <li>• Neidhardt, John (authorised to take exams)</li> <li>• Koch, Karl-Wilhelm (authorised to take exams)</li> <li>• Jüschke, Christoph (authorised to take exams)</li> </ul>		
<b>Prerequisites</b>	BSc (Biology, Biochemistry)		
<b>Skills to be acquired in this module</b>	<p>++ deepened biological expertise            ++ deepened knowledge of biological working methods            + data analysis skills            ++ interdisciplinary thinking            + critical and analytical thinking            + independent searching and knowledge of scientific literature            + data presentation and discussion (E) (written and spoken)            + teamwork            + ethics and professional behaviour            + project and time management</p> <p>Addressing students with an emphasis on molecular biology, molecular genetics, cell biology, and neurobiology</p>		
<b>Module contents</b>	<p>Lecture: To improve knowledge in molecular genetics, molecular biology and cell biology in correlation with human diseases. Exercise: Learn to transfer the theoretical knowledge to experiments. Gaining methodological knowledge in molecular genetics, cell biology and therapeutic approaches. Initial training on how to perform research projects. Subjects of the lecture and seminar: Molecular bases of neurodegenerative diseases, structure and function of DNA/RNA/proteins/membranes, cytoskeleton, cell cycle, programmed cell death, cells in the social structure. Exercises: Learning current methods of molecular biology and human genetics; high throughput technologies, introduction to cell cultivation techniques.</p>		
<b>Recommended reading</b>	Textbooks of Cell Biology		
<b>Links</b>	<a href="http://www.uni-oldenburg.de/humangenetik/">http://www.uni-oldenburg.de/humangenetik/</a>		
<b>Language of instruction</b>	English		
<b>Duration (semesters)</b>	1 Semester		
<b>Module frequency</b>	winter term		
<b>Module capacity</b>	15		
<b>Reference text</b>	associated with bio900		
<b>Type of module</b>	Wahlpflicht / Elective		
<b>Module level</b>	MM (Mastermodul / Master module)		
<b>Teaching/Learning method</b>	Lecture, seminar, exercise		
<b>Previous knowledge</b>	Basic knowledge in cell biology, genetics, biochemistry		
<b>Examination</b>	<b>Prüfungszeiten</b>	<b>Type of examination</b>	
<b>Final exam of module</b>		written examination (70 %), paper(s) presentation 30 %; not graded: signed lab protocols, regular active participation is required for the module to be passed.	
<b>Type of course</b>	<b>Comment</b>	<b>SWS</b>	<b>Frequency</b>
			<b>Workload of compulsory attendance</b>
Lecture		2	WiSe
Seminar		1	WiSe
			28
			14

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Type of course	Comment	SWS	Frequency	Workload of compulsory attendance
Exercises		5	WiSe	70
<b>Total module attendance time</b>				<b>112 h</b>

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## bio845 - Introduction to Development and Evolution

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

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

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### 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

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### Recommended reading

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

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

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

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

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

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## bio846 - Lab Exercises in Development and Evolution

<b>Module label</b>	Lab Exercises in Development and Evolution
<b>Module code</b>	bio846
<b>Credit points</b>	6.0 KP
<b>Workload</b>	180 h
<b>Applicability of the module</b>	<ul style="list-style-type: none"><li>• Master's Programme Biology (Master) &gt; Background Modules</li><li>• Master's Programme Biology (Master) &gt; Background Modules</li><li>• Master's Programme Neuroscience (Master) &gt; Background Modules</li></ul>
<b>Responsible persons</b>	<ul style="list-style-type: none"><li>• Sienknecht, Ulrike (module responsibility)</li><li>• Sienknecht, Ulrike (Module counselling)</li><li>• Sienknecht, Ulrike (authorised to take exams)</li><li>• Claußen, Maike (authorised to take exams)</li><li>• Ebbers, Lena (authorised to take exams)</li></ul>
<b>Prerequisites</b>	mandatory prerequisite is the module bio845 (neu110) (Introduction to Development and Evolution)

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### 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

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### 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

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### Recommended reading

**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

<b>Links</b>		
<b>Language of instruction</b>	English	
<b>Duration (semesters)</b>	1 winter term Semester	
<b>Module frequency</b>	winter term	
<b>Module capacity</b>	6 (	
	selection criteria: advance of studies in MA program	
	)	
<b>Reference text</b>		
	Associated with bio845 (neu110) (Introduction to Development and Evolution)	
<b>Type of module</b>		
	Wahlpflicht / Elective	
<b>Module level</b>		
	MM (Mastermodul / Master module)	
<b>Teaching/Learning method</b>		
	Exercise, lecture, seminar	
<b>Previous knowledge</b>		
	organismic biology, experience with lab work	
Examination	Prüfungszeiten	Type of examination
<b>Final exam of module</b>		
	same winter term	1 report
<b>Type of course</b>		
	Exercises	
<b>SWS</b>	6	
<b>Frequency</b>	WiSe	
<b>Workload attendance time</b>	90 h	



## bio860 - Comparative Developmental Biology

<b>Module label</b>	Comparative Developmental Biology	
<b>Module code</b>	bio860	
<b>Credit points</b>	6.0 KP	
<b>Workload</b>	180 h	
<b>Applicability of the module</b>	<ul style="list-style-type: none"> <li>• Master's Programme Biology (Master) &gt; Background Modules</li> <li>• Master's Programme Biology (Master) &gt; Background Modules</li> </ul>	
<b>Responsible persons</b>	<ul style="list-style-type: none"> <li>• Sienknecht, Ulrike (module responsibility)</li> <li>• Sienknecht, Ulrike (authorised to take exams)</li> </ul>	
<b>Prerequisites</b>		
<b>Skills to be acquired in this module</b>	++ 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	
<b>Module contents</b>	Lectures and Lab exercises in topics of evolutionary developmental biology, i.e. comparative developmental biology, such as the development of sensory systems in different species.	
<b>Recommended reading</b>	Gilbert S.F., Development, Macmillan Publishers Ltd, 11th edition 2016	
<b>Links</b>		
<b>Language of instruction</b>	English	
<b>Duration (semesters)</b>	1 Semester	
<b>Module frequency</b>	summer term	
<b>Module capacity</b>	6 (	
	Reihenfolge der Anmeldungen	
	)	
<b>Reference text</b>	associated with bio845 Introduction to Development and Evolution	
<b>Type of module</b>	Wahlpflicht / Elective	
<b>Module level</b>	MM (Mastermodul / Master module)	
<b>Teaching/Learning method</b>	Lecture, exercise, seminar	
<b>Examination</b>	Prüfungszeiten	Type of examination
<b>Final exam of module</b>	same summer term	protocol
<b>Type of course</b>	Exercises	
<b>SWS</b>	6	
<b>Frequency</b>	SuSe	
<b>Workload attendance time</b>	84 h	

## bio695 - Biochemical concepts in signal transduction

<b>Module label</b>	Biochemical concepts in signal transduction			
<b>Module code</b>	bio695			
<b>Credit points</b>	12.0 KP			
<b>Workload</b>	360 h			
<b>Applicability of the module</b>	<ul style="list-style-type: none"> <li>• Master's Programme Biology (Master) &gt; Background Modules</li> <li>• Master's Programme Biology (Master) &gt; Background Modules</li> <li>• Master's Programme Molecular Biomedicine (Master) &gt; Background Modules</li> <li>• Master's Programme Neuroscience (Master) &gt; Background Modules</li> </ul>			
<b>Responsible persons</b>	<ul style="list-style-type: none"> <li>• Koch, Karl-Wilhelm (module responsibility)</li> <li>• Koch, Karl-Wilhelm (authorised to take exams)</li> <li>• Scholten, Alexander (authorised to take exams)</li> <li>• Scholten, Alexander (Module counselling)</li> </ul>			
<b>Prerequisites</b>	none			
<b>Skills to be acquired in this module</b>	++ 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			
<b>Module contents</b>	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			
<b>Recommended reading</b>	Textbooks of cell biology and biochemistry. Current literature on topics of signal transduction (as announced in the preparatory meeting).			
<b>Links</b>				
<b>Language of instruction</b>	English			
<b>Duration (semesters)</b>	1 Semester			
<b>Module frequency</b>	winter term			
<b>Module capacity</b>	20			
<b>Type of module</b>	Wahlpflicht / Elective			
<b>Module level</b>	MM (Mastermodul / Master module)			
<b>Teaching/Learning method</b>	Lecture, seminar, exercise			
Examination	Prüfungszeiten	Type of examination		
<b>Final exam of module</b>		written examination (90 minutes) (50%), protocols (50%) Prerequisite for passing the module is active participation: Presentation(s) in the seminar		
Type of course	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		1	WiSe	14
Seminar		1	WiSe	14
Exercises		6	WiSe	84
<b>Total module attendance time</b>				112 h

## neu210 - Neurosensory Science and Behaviour

<b>Module label</b>	Neurosensory Science and Behaviour
<b>Module code</b>	neu210
<b>Credit points</b>	9.0 KP
<b>Workload</b>	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 )
<b>Applicability of the module</b>	<ul style="list-style-type: none"> <li>• Master's Programme Biology (Master) &gt; Background Modules</li> <li>• Master's Programme Biology (Master) &gt; Background Modules</li> <li>• Master's Programme Neuroscience (Master) &gt; Background Modules</li> </ul>
<b>Responsible persons</b>	<ul style="list-style-type: none"> <li>• Langemann, Ulrike (module responsibility)</li> <li>• Klump, Georg Martin (authorised to take exams)</li> <li>• Mouritsen, Henrik (authorised to take exams)</li> <li>• Langemann, Ulrike (authorised to take exams)</li> <li>• Albert, Jörg (authorised to take exams)</li> <li>• Clemens, Jan (authorised to take exams)</li> <li>• Langemann, Ulrike (Module counselling)</li> <li>• Mouritsen, Henrik (Module counselling)</li> </ul>
<b>Prerequisites</b>	Fundamentals of Neurobiology, Behavioural Biology, Evolution, Ecology
<b>Skills to be acquired in this module</b>	<p>++ Neurosci. knowlg. + Expt. methods + Independent research + Scient. literature + Social skills            ++ Interdiscipl. knowlg. Maths/Stats/Progr. + Data present./disc. + Scientific English Ethics</p> <p>Upon successful completion of this course, students</p> <ul style="list-style-type: none"> <li>• know the fundamentals of behavioural ecology and neuroethology</li> <li>• are able to present and critically assess scientific data and approaches</li> </ul>
<b>Module contents</b>	<p>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.</p> <p>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.</p> <p>In the seminar "Current issues of Ethology", current original literature relating to behavioural biology is reported and discussed.</p>
<b>Recommended reading</b>	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
<b>Links</b>	
<b>Language of instruction</b>	English
<b>Duration (semesters)</b>	1 Semester
<b>Module frequency</b>	jährlich
<b>Module capacity</b>	26 (  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"

)

<b>Reference text</b>		Course in the second half of the semester Regular active participation is required to pass the module.		
Examination	Prüfungszeiten	Type of examination		
<b>Final exam of module</b>	as agreed, usually in the break after the winter term	80% written exam (content of the two lecture series), 20% presentation(s)		
Type of course	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		4		56
Seminar		2		28
<b>Total module attendance time</b>				84 h

## neu220 - Neurocognition and Psychopharmacology

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

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

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

## neu141 - Visual Neuroscience - Physiology and Anatomy

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

Background and seminar literature will be available in Stud.IP.

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



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## neu360 - Auditory Neuroscience

<b>Module label</b>	Auditory Neuroscience
<b>Module code</b>	neu360
<b>Credit points</b>	6.0 KP
<b>Workload</b>	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 exercise (UE) Total workload 90h: 10 h contact / 20 h literature search / 60 h work on essay paper  )
<b>Applicability of the module</b>	<ul style="list-style-type: none"><li>• Master's Programme Biology (Master) &gt; Background Modules</li><li>• Master's Programme Biology (Master) &gt; Background Modules</li><li>• Master's Programme Neuroscience (Master) &gt; Background Modules</li></ul>
<b>Responsible persons</b>	<ul style="list-style-type: none"><li>• Ashida, Go (module responsibility)</li><li>• Puschmann, Sebastian (authorised to take exams)</li><li>• Ashida, Go (authorised to take exams)</li><li>• Puschmann, Sebastian (Module counselling)</li></ul>
<b>Prerequisites</b>	Recommended previous knowledge/skills: Basics of Neurosensory Science and Behavioural Biology
<b>Skills to be acquired in this module</b>	<p>++ Neurosci. knowlg + Expt. methods ++ Scient. Literature + Social skills ++ Interdiscipl. knowlg ++ Data present./disc. ++ Scientific English + Ethics</p> <p>Introduction to Auditory Physiology. May serve as preparation for a Research Module in this area.</p> <p>Upon successful completion of this course, students</p> <ul style="list-style-type: none"><li>• have profound knowledge on auditory sensory processing at several levels (including cochlear transduction mechanisms, central auditory processing)</li><li>• have basic knowledge of the large range of techniques used in auditory research</li><li>• are able to read and critically report to others on an original research paper in auditory neuroscience</li><li>• are able to research and review a specific topic in auditory neuroscience</li></ul>
<b>Module contents</b>	<p>One week introductory block course, comprised of a lecture series and matching seminar that emphasizes discussion.</p> <p>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</p>

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.

**Recommended reading**

About 20 selected original papers (selection varies)  
 Pickles JO (2012) An Introduction to the Physiology of Hearing. Brill, Netherlands

**Links**

<b>Language of instruction</b>	English
<b>Duration (semesters)</b>	1 Semester
<b>Module frequency</b>	annually, summer term, second half
<b>Module capacity</b>	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
<b>Final exam of module</b>		HA
	within a few weeks of the end of summer term lecture period	

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

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## neu340 - Invertebrate Neuroscience - Neurophysiology

<b>Module label</b>	Invertebrate Neuroscience - Neurophysiology
<b>Module code</b>	neu340
<b>Credit points</b>	6.0 KP
<b>Workload</b>	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)  )
<b>Applicability of the module</b>	<ul style="list-style-type: none"><li>• Master's Programme Biology (Master) &gt; Background Modules</li><li>• Master's Programme Biology (Master) &gt; Background Modules</li><li>• Master's Programme Neuroscience (Master) &gt; Background Modules</li></ul>
<b>Responsible persons</b>	<ul style="list-style-type: none"><li>• Kretzberg, Jutta (module responsibility)</li><li>• Kretzberg, Jutta (authorised to take exams)</li><li>• Albert, Jörg (authorised to take exams)</li></ul>
<b>Prerequisites</b>	attendance in pre-meeting
<b>Skills to be acquired in this module</b>	<p>++ Neurosci. knowlg. ++ Expt. Methods + Scient. Literature + Social skills + Maths/Stats/Progr. + Independent Research + Data present./disc. + Scientific English + Ethics</p> <p>Upon successful completion of this course, students</p> <ul style="list-style-type: none"><li>• have knowledge on invertebrate neuronal systems in comparison to vertebrate systems</li><li>• have discussed an overview of experimental and theoretical methods of invertebrate neuroscienc</li><li>• have acquired first practical skills in intracellular recordings from invertebrate neurons</li><li>• have acquired basic skills in data analysis</li><li>• have acquired an intuitive understanding of membrane potential and action potential generation based on computer simulations</li></ul>
<b>Module contents</b>	<p>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.</p> <p>The seminar covers the following topics:</p> <ul style="list-style-type: none"><li>• Invertebrate neuronal systems in comparison to vertebrate systems</li><li>• Ion channels, membrane potential and action potential generation</li><li>• Introduction to electrophysiological methods</li><li>• Introduction to data analysis methods</li></ul> <p>In the practical exercises, portfolio assignments will be performed on:</p> <ul style="list-style-type: none"><li>• Qualitative electrophysiological classification of different cell types in the leech nervous system</li><li>• Quantitative analysis (stimulus - response relationship) of at least one cell type</li><li>• Action potential generation: Comparison of model simulations and experiments</li></ul>

- 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

<b>Recommended reading</b>	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			
<b>Links</b>				
<b>Language of instruction</b>	English			
<b>Duration (semesters)</b>	1 Semester			
<b>Module frequency</b>	annually, summer term, second half			
<b>Module capacity</b>	12 ( this module provides the background for neu345 "Neural Computation in invertebrate systems" )			
<b>Type of module</b>	Wahlpflicht / Elective			
<b>Previous knowledge</b>	basic knowledge of neurobiology, basic MATLAB programming skills			
<b>Examination</b>	<b>Prüfungszeiten</b>	<b>Type of examination</b>		
<b>Final exam of module</b>	during the course (summer term, second half)	Portfolio consisting of short tests, short reports (according to portfolio assignments) and seminar presentation		
<b>Type of course</b>	<b>Comment</b>	<b>SWS</b>	<b>Frequency</b>	<b>Workload of compulsory attendance</b>
Seminar		2	SuSe	28
Exercises		3	SuSe	42
<b>Total module attendance time</b>				<b>70 h</b>

## neu310 - Psychophysics of Hearing

<b>Module label</b>	Psychophysics of Hearing			
<b>Module code</b>	neu310			
<b>Credit points</b>	12.0 KP			
<b>Workload</b>	360 h ( 5 SWS Practical (PR) "Experiments in Hearing" Total workload 225h: 70h contact / 110h experimental work / 45h exam preparation 1 SWS Supervised exercise (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 )			
<b>Applicability of the module</b>	<ul style="list-style-type: none"> <li>• Master's Programme Biology (Master) &gt; Background Modules</li> <li>• Master's Programme Biology (Master) &gt; Background Modules</li> <li>• Master's Programme Neuroscience (Master) &gt; Background Modules</li> </ul>			
<b>Responsible persons</b>	<ul style="list-style-type: none"> <li>• Klump, Georg Martin (module responsibility)</li> <li>• Klump, Georg Martin (authorised to take exams)</li> <li>• Langemann, Ulrike (authorised to take exams)</li> <li>• Beutelmann, Rainer (authorised to take exams)</li> <li>• Beutelmann, Rainer (Module counselling)</li> </ul>			
<b>Prerequisites</b>				
<b>Skills to be acquired in this module</b>	+ 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 provided with an overview of the mechanisms of auditory perception.			
<b>Module contents</b>	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.			
<b>Recommended reading</b>	Plack, Christopher J. (2005) The sense of hearing. Mahwah, NJ [u.a.] : Erlbaum (sufficient number of copies available in the university library)			
<b>Links</b>				
<b>Language of instruction</b>	English			
<b>Duration (semesters)</b>	1 Semester			
<b>Module frequency</b>	annually, summer term, second half			
<b>Module capacity</b>	8 (in total with bio640)			
<b>Type of module</b>	je nach Studiengang Pflicht oder Wahlpflicht			
<b>Module level</b>	---			
Examination	Prüfungszeiten	Type of examination		
<b>Final exam of module</b>	end of summer term	70% report or oral exam, 30% presentation In addition, mandatory but ungraded: regular active participation		
Type of course	Comment	SWS	Frequency	Workload of compulsory attendance
Exercises		1	SuSe	14
Seminar		2	SuSe	28
Practical training		5	SuSe	70
Lecture			SuSe	0
<b>Total module attendance time</b>				112 h

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## Research Modules

### bio900 - Biology Research Module

<b>Module label</b>	Biology Research Module
<b>Module code</b>	bio900
<b>Credit points</b>	15.0 KP
<b>Workload</b>	450 h
<b>Applicability of the module</b>	<ul style="list-style-type: none"><li>• Master's Programme Biology (Master) &gt; Research Modules</li><li>• Master's Programme Biology (Master) &gt; Research Modules</li></ul>
<b>Responsible persons</b>	<ul style="list-style-type: none"><li>• Zotz, Gerhard (module responsibility)</li><li>• der Biologie, Lehrende (Module counselling)</li><li>• der Biologie, Lehrende (authorised to take exams)</li></ul>
<b>Prerequisites</b>	
<b>Skills to be acquired in this module</b>	<p>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.</p> <ul style="list-style-type: none"><li>+ deepened knowledge of biological working methods</li><li>++ data analysis skills</li><li>++ critical and analytical thinking</li><li>++ independent searching and knowledge of scientific literature</li><li>++ ability to perform independent biological research</li><li>++ data presentation and discussion in German and English (written and spoken)</li><li>+ teamwork</li><li>++ project and time management</li><li>+ statistics &amp; scientific programming</li></ul>
<b>Module contents</b>	<p>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</p>
<b>Recommended reading</b>	
<b>Links</b>	<p><a href="https://uol.de/en/biology/groups-our-research">https://uol.de/en/biology/groups-our-research</a></p>
<b>Language of instruction</b>	English
<b>Duration (semesters)</b>	1 Semester
<b>Module frequency</b>	winter and summer term
<b>Module capacity</b>	unlimited
<b>Reference text</b>	<p>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 examiners, <a href="https://uol.de/fk5/studium/studiengaenge/pruefungsberechtigte">https://uol.de/fk5/studium/studiengaenge/pruefungsberechtigte</a>). Please refer to the list of options in Stud.IP and contact potential supervisors directly.</p> <p>Within the Modul bio900 it is 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.</p>

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<b>Type of module</b>	Wahlpflicht / Elective	
<b>Module level</b>	MM (Mastermodul / Master module)	
<b>Teaching/Learning method</b>	Project-based components	
Examination	Prüfungszeiten	Type of examination
<b>Final exam of module</b>	internship report	

Type of course	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture (optional)			SuSe or WiSe	0
Seminar		1	SuSe or WiSe	14
Project-orientated module		10	SuSe and WiSe	140
<b>Total module attendance time</b>				<b>154 h</b>

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## bio810 - External Research Project

Module label	External Research Project
Module code	bio810
Credit points	15.0 KP
Workload	450 h
Applicability of the module	<ul style="list-style-type: none"><li>• Master's Programme Biology (Master) &gt; Research Modules</li><li>• Master's Programme Biology (Master) &gt; Research Modules</li></ul>
Responsible persons	<ul style="list-style-type: none"><li>• Zotz, Gerhard (module responsibility)</li><li>• der Biologie, Lehrende (authorised to take exams)</li></ul>
Prerequisites	

External research projects are done on an individual basis. They are supervised by one person from Oldenburg (see list of examiners, <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)

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### 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 organising 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

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### 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 Biology faculty at the University of Oldenburg can act as local supervisor (see list of examiners, <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.

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### Recommended reading

varies with chosen topic



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**Links**

<b>Language of instruction</b>	English	
<b>Duration (semesters)</b>	1 Semester	
<b>Module frequency</b>	Summer and winter term	
<b>Module capacity</b>	unlimited	
<b>Type of module</b>	Wahlpflicht / Elective	
<b>Module level</b>	MM (Mastermodul / Master module)	
<b>Teaching/Learning method</b>	Project-based component	
Examination	Prüfungszeiten	Type of examination
<b>Final exam of module</b>		internship report

Type of course	Comment	SWS	Frequency	Workload of compulsory attendance
Seminar		1	SuSe and WiSe	14
Project-orientated module		10	SuSe and WiSe	140
<b>Total module attendance time</b>				154 h

## bio820 - Research Module Fast Track

<b>Module label</b>	Research Module Fast Track	
<b>Module code</b>	bio820	
<b>Credit points</b>	15.0 KP	
<b>Workload</b>	450 h	
<b>Applicability of the module</b>	<ul style="list-style-type: none"> <li>• Master's Programme Biology (Master) &gt; Research Modules</li> <li>• Master's Programme Biology (Master) &gt; Research Modules</li> </ul>	
<b>Responsible persons</b>	<ul style="list-style-type: none"> <li>• Klump, Georg Martin (module responsibility)</li> <li>• Klump, Georg Martin (authorised to take exams)</li> </ul>	
<b>Prerequisites</b>		
<b>Skills to be acquired in this module</b>	<p>[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 &amp; scientific programming [/nop]</p>	
<b>Module contents</b>		
<b>Recommended reading</b>		
<b>Links</b>		
<b>Language of instruction</b>	English	
<b>Duration (semesters)</b>	1 Semester	
<b>Module frequency</b>	irregular	
<b>Module capacity</b>	unlimited	
<b>Type of module</b>	Wahlpflicht / Elective	
<b>Module level</b>	MM (Mastermodul / Master module)	
<b>Teaching/Learning method</b>	Project-based component	
<b>Examination</b>	Prüfungszeiten	Type of examination
<b>Final exam of module</b>	internship report	
<b>Type of course</b>	Seminar	
<b>SWS</b>	1	
<b>Frequency</b>	--	

# Skills Modules

## bio870 - Communicating Biology

<b>Module label</b>	Communicating Biology	
<b>Module code</b>	bio870	
<b>Credit points</b>	6.0 KP	
<b>Workload</b>	180 h	
<b>Applicability of the module</b>	<ul style="list-style-type: none"> <li>• Master's Programme Biology (Master) &gt; Skills Modules</li> <li>• Master's Programme Biology (Master) &gt; Skills Modules</li> </ul>	
<b>Responsible persons</b>	<ul style="list-style-type: none"> <li>• Zotz, Gerhard (module responsibility)</li> <li>• Albach, Dirk Carl (Module counselling)</li> <li>• Schmaljohann, Heiko (Module counselling)</li> <li>• Zotz, Gerhard (authorised to take exams)</li> <li>• Albach, Dirk Carl (authorised to take exams)</li> <li>• Schmaljohann, Heiko (authorised to take exams)</li> <li>• Nolte, Arne (authorised to take exams)</li> <li>• Will, Maria (authorised to take exams)</li> <li>• Heim, Wieland (authorised to take exams)</li> <li>• Khan, Gulzar (authorised to take exams)</li> </ul>	
<b>Prerequisites</b>		
<b>Skills to be acquired in this module</b>	<p>Communicating and practicing scientific presentation techniques (talk, publication, poster) Presentation of data and discussion in spoken and written (english) Practising and improving oral presentation skills and scientific writing. Independent writing of an in-depth literature review of a chosen biological topic demonstrating a comprehensive overview of the literature and a critical discussion of challenges and gaps in the particular field and scientific writing Independent investigation and knowledge of scientific primary literature</p> <p>+ interdisciplinary thinking            ++ critical and analytical thinking            ++ independent searching and knowledge of scientific literature            ++ data presentation and discussion (written and spoken)</p>	
<b>Module contents</b>	<p>S: Working group seminar (2 SWS; Choice 1: Functional Ecology; Choice 2: Plant biodiversity and evolution) S: Scientific Communication in Biology (2SWS)</p>	
<b>Recommended reading</b>		
<b>Links</b>		
<b>Language of instruction</b>	English	
<b>Duration (semesters)</b>	1 Semester	
<b>Module frequency</b>	annually, winter term	
<b>Module capacity</b>	12	
<b>Type of module</b>	Wahlmodul / Opportunity	
<b>Module level</b>	MM (Mastermodul / Master module)	
<b>Teaching/Learning method</b>	Seminar	
<b>Previous knowledge</b>	Ecology, flora, genetics	
Examination	Prüfungszeiten	Type of examination
<b>Final exam of module</b>	1 term paper	
<b>Type of course</b>	Seminar	
<b>SWS</b>	4	

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**Frequency**

WiSe

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**Workload attendance time**

56 h

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## bio880 - Skills in Plant Systematics

<b>Module label</b>	Skills in Plant Systematics			
<b>Module code</b>	bio880			
<b>Credit points</b>	6.0 KP			
<b>Workload</b>	180 h			
<b>Applicability of the module</b>	<ul style="list-style-type: none"> <li>• Master's Programme Biology (Master) &gt; Skills Modules</li> <li>• Master's Programme Biology (Master) &gt; Skills Modules</li> </ul>			
<b>Responsible persons</b>	<ul style="list-style-type: none"> <li>• Albach, Dirk Carl (module responsibility)</li> <li>• von Hagen, Klaus Bernhard (Module counselling)</li> <li>• Albach, Dirk Carl (authorised to take exams)</li> <li>• von Hagen, Klaus Bernhard (authorised to take exams)</li> <li>• Khan, Gulzar (authorised to take exams)</li> </ul>			
<b>Prerequisites</b>				
<b>Skills to be acquired in this module</b>	<p>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.</p> <p>+ 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 &amp; scientific programming</p>			
<b>Module contents</b>	<p>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.</p>			
<b>Recommended reading</b>				
<b>Links</b>				
<b>Language of instruction</b>	English			
<b>Duration (semesters)</b>	1 Semester			
<b>Module frequency</b>	winter term			
<b>Module capacity</b>	8			
<b>Type of module</b>	Wahlmodul / Opportunity			
<b>Module level</b>	MM (Mastermodul / Master module)			
<b>Teaching/Learning method</b>	Seminar, exercise			
<b>Previous knowledge</b>	Good knowledge of native flora			
Examination	Prüfungszeiten	Type of examination		
<b>Final exam of module</b>	2 examinations: 1 presentation (50%); 1 report (50%)			
Type of course	Comment	SWS	Frequency	Workload of compulsory attendance
Seminar		2	WiSe	28

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Type of course	Comment	SWS	Frequency	Workload of compulsory attendance
Exercises		2	WiSe	28
<b>Total module attendance time</b>				<b>56 h</b>

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## bio890 - Current Topics in Biology

<b>Module label</b>	Current Topics in Biology	
<b>Module code</b>	bio890	
<b>Credit points</b>	3.0 KP	
<b>Workload</b>	90 h	
<b>Applicability of the module</b>	<ul style="list-style-type: none"> <li>• Master's Programme Biology (Master) &gt; Skills Modules</li> <li>• Master's Programme Biology (Master) &gt; Skills Modules</li> <li>• Master's Programme Landscape Ecology (Master) &gt; Wahlpflichtmodule</li> </ul>	
<b>Responsible persons</b>	<ul style="list-style-type: none"> <li>• Gerlach, Gabriele (module responsibility)</li> <li>• Gerlach, Gabriele (authorised to take exams)</li> <li>• Laakmann, Silke (authorised to take exams)</li> <li>• Beutelmann, Rainer (authorised to take exams)</li> <li>• Bartölke, Rabea (authorised to take exams)</li> <li>• Fleischmann, Pauline (authorised to take exams)</li> </ul>	
<b>Prerequisites</b>		
<b>Skills to be acquired in this module</b>	<p>+ 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</p> <p>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.</p>	
<b>Module contents</b>	<p>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.</p>	
<b>Recommended reading</b>	<p>Varies with chosen topic (will be provided by the instructor(s) at the beginning of the course)</p>	
<b>Links</b>		
<b>Language of instruction</b>	English	
<b>Duration (semesters)</b>	1 Semester	
<b>Module frequency</b>	Summer and winter term	
<b>Module capacity</b>	unlimited	
<b>Type of module</b>	Wahlmodul / Opportunity	
<b>Module level</b>	MM (Mastermodul / Master module)	
<b>Teaching/Learning method</b>	Seminar	
<b>Previous knowledge</b>	Participation in one or more basic modules of the Master Biology	
Examination	Prüfungszeiten	Type of examination
<b>Final exam of module</b>	open	Final exam of module: 1 Portfolio. Components vary in the seminars. They are specified in Stud.IP in the respective seminar.

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<b>Type of course</b>	Seminar
<b>SWS</b>	2
<b>Frequency</b>	SuSe and WiSe
<b>Workload attendance time</b>	28 h



## neu730 - Biosciences in the Public Eye and in our Laws

<b>Module label</b>	Biosciences in the Public Eye and in our Laws
<b>Module code</b>	neu730
<b>Credit points</b>	6.0 KP
<b>Workload</b>	180 h ( 56h contact / 84h research for presentations / 40h term paper )
<b>Applicability of the module</b>	<ul style="list-style-type: none"> <li>• Master's Programme Biology (Master) &gt; Skills Modules</li> <li>• Master's Programme Biology (Master) &gt; Skills Modules</li> <li>• Master's Programme Neuroscience (Master) &gt; Skills Modules</li> </ul>
<b>Responsible persons</b>	<ul style="list-style-type: none"> <li>• Sienknecht, Ulrike (module responsibility)</li> <li>• Sienknecht, Ulrike (authorised to take exams)</li> </ul>
<b>Prerequisites</b>	
<b>Skills to be acquired in this module</b>	<p>+ Expt. methods + Scient. Literature ++ Social skills ++ Interdiscipl. knowl/g + Data present./disc. + Scientific English ++ Ethics</p> <p>Upon completion of this course, students</p> <ul style="list-style-type: none"> <li>• know basic rules of good scientific practise</li> <li>• are aware of the legal framework that is relevant to biological research, e.g. on animal welfare or genetically modified organisms</li> <li>• have practised to research and summarize different viewpoints on biological research, using both scientific (peer-reviewed) and non-scientific sources</li> <li>• are able to identify and critically discuss ethical conflicts in biological research, e.g., in the context of stem cell research or data manipulation</li> <li>• are able to prepare and give a coherent presentation in a team</li> <li>• have practised to lead a group discussion</li> </ul>
<b>Module contents</b>	<p>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.</p> <p>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</p> <p>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.</p>
<b>Recommended reading</b>	
<b>Links</b>	
<b>Language of instruction</b>	English
<b>Duration (semesters)</b>	1 Semester
<b>Module frequency</b>	annually, summer term
<b>Module capacity</b>	12
<b>Type of module</b>	Wahlpflicht / Elective

<b>Module level</b>	MM (Mastermodul / Master module)			
<b>Previous knowledge</b>	Fundamentals of genetics, physiology, ecology and biological systematics			
Examination	Prüfungszeiten	Type of examination		
<b>Final exam of module</b>	within a few weeks of summer term lecture period	Term paper Regular participation during the semester is required (max 3 days of absence)		
Type of course	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture			SuSe	0
Seminar and exercise		4	SuSe	56
<b>Total module attendance time</b>				56 h

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## neu751 - Laboratory Animal Science

<b>Module label</b>	Laboratory Animal Science
<b>Module code</b>	neu751
<b>Credit points</b>	3.0 KP
<b>Workload</b>	90 h ( one week full-time in semester break + flexible time for studying and exam preparation  1 SWS Lecture total workload 45h: 2h contact / 20h background reading / 23h exam preparation  1 SWS Supervised exercise total workload 45h: 35h contact / 10h background reading )
<b>Applicability of the module</b>	<ul style="list-style-type: none"><li>• Master's Programme Biology (Master) &gt; Skills Modules</li><li>• Master's Programme Biology (Master) &gt; Skills Modules</li><li>• Master's Programme Molecular Biomedicine (Master) &gt; Skills Modules</li><li>• Master's Programme Neuroscience (Master) &gt; Skills Modules</li></ul>
<b>Responsible persons</b>	<ul style="list-style-type: none"><li>• Köppl, Christine (authorised to take exams)</li><li>• Langemann, Ulrike (authorised to take exams)</li><li>• Winkhofer, Michael (authorised to take exams)</li><li>• Nolte, Arne (authorised to take exams)</li><li>• Heyers, Dominik (authorised to take exams)</li><li>• Ebbers, Lena (authorised to take exams)</li><li>• Dedek, Karin (authorised to take exams)</li><li>• Schmaljohann, Heiko (authorised to take exams)</li><li>• Helgers, Simeon (module responsibility)</li></ul>
<b>Prerequisites</b>	none
<b>Skills to be acquired in this module</b>	++ Expt. Methods + Independent Research + Scient. Literature ++ Social skills ++ Interdiscipl. knowlg + Scientific English ++ Ethics  Upon successful completion of this course, students <ul style="list-style-type: none"><li>• know the relevant EU legislation governing animal welfare and are able to explain its meaning in common language</li><li>• understand and are able to critically discuss salient ethical concepts in animal experimentation, such as the three Rs and humane endpoint.</li><li>• have basic knowledge of the biology and husbandry of laboratory animal species held at the University of Oldenburg (rodents or birds or fish)</li><li>• are able to critically assess the needs and welfare of animals without compromising scientific integrity of the investigation</li><li>• have practical skills in handling small rodents or birds or fish</li><li>• have profound knowledge of anaesthesia, analgesia and basic principles of surgery.</li><li>• have practised invasive procedures and euthanasia.</li></ul> <p>NOTE: These objectives aim to satisfy the requirements for EU directive A „Persons carrying out animal experiments“ and EU directive D „Persons killing animals“.</p>
<b>Module contents</b>	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: <ul style="list-style-type: none"><li>• Legislation, ethics and the 3Rs</li><li>• Scientific integrity</li><li>• Data collection "</li><li>• Basic biology of rodents, birds and fish</li><li>• Husbandry, and nutrition of rodents, birds and fish</li><li>• Animal Welfare</li><li>• Health monitoring</li><li>• Pain and distress</li><li>• Euthanasia</li></ul>

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

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

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

## neu760 - Scientific English

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

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

## neu780 - Biological Data Analysis with Python

<b>Module label</b>	Biological Data Analysis with Python			
<b>Module code</b>	neu780			
<b>Credit points</b>	6.0 KP			
<b>Workload</b>	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 )			
<b>Applicability of the module</b>	<ul style="list-style-type: none"> <li>• Master's Programme Biology (Master) &gt; Skills Modules</li> <li>• Master's Programme Biology (Master) &gt; Skills Modules</li> <li>• Master's Programme Neuroscience (Master) &gt; Skills Modules</li> </ul>			
<b>Responsible persons</b>	<ul style="list-style-type: none"> <li>• Winkhofer, Michael (module responsibility)</li> <li>• Winkhofer, Michael (authorised to take exams)</li> </ul>			
<b>Prerequisites</b>				
<b>Skills to be acquired in this module</b>	<p>+ Neurosci. knowlg. ++ Maths/Stats/Progr. + Data present./disc.</p> <p>The objective of the module is the acquisition 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 <a href="https://www.python.org/">https://www.python.org/</a>.</p> <p>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).</p> <p>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 synthetic data from various noise models to assess signal-to-noise ratio in instrumental datasets.</p>			
<b>Module contents</b>	Data types and data structures, control structures, functions, modules, file input/output Standard libraries and SciPy libraries (Matplotlib, NumPy,...), scikit-image, VPython, ...			
<b>Recommended reading</b>	open access <a href="http://www.swaroopch.com/notes/python/">http://www.swaroopch.com/notes/python/</a> <a href="http://docs.python.org/3/tutorial/index.html">http://docs.python.org/3/tutorial/index.html</a>			
<b>Links</b>				
<b>Language of instruction</b>	English			
<b>Duration (semesters)</b>	1 Semester			
<b>Module frequency</b>	semester break, annually			
<b>Module capacity</b>	20			
<b>Reference text</b>	Shared course components with (cannot be credited twice): pb328 "Einführung in Datenanalyse mit Python" (Professionalisierungsmodul im Bachelorstudiengang Biologie)			
<b>Examination</b>	<b>Prüfungszeiten</b>		<b>Type of examination</b>	
<b>Final exam of module</b>	term break, immediately after the course (2 weeks in February)		assignment of programming exercises, 4 out of 5 exercises to be assessed	
<b>Type of course</b>	<b>Comment</b>	<b>SWS</b>	<b>Frequency</b>	<b>Workload of compulsory attendance</b>
Lecture		2	WiSe	28
Exercises		2	WiSe	28
<b>Total module attendance time</b>				56 h

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## neu790 - Communicating Neuroscience

<b>Module label</b>	Communicating Neuroscience
<b>Module code</b>	neu790
<b>Credit points</b>	3.0 KP
<b>Workload</b>	90 h (  90 h  (28 h contact / 62 h individual reading and preparing discussion questions)  )
<b>Applicability of the module</b>	<ul style="list-style-type: none"><li>• Master's Programme Biology (Master) &gt; Skills Modules</li><li>• Master's Programme Biology (Master) &gt; Skills Modules</li><li>• Master's Programme Neuroscience (Master) &gt; Skills Modules</li></ul>
<b>Responsible persons</b>	<ul style="list-style-type: none"><li>• Kretzberg, Jutta (module responsibility)</li><li>• Kretzberg, Jutta (authorised to take exams)</li><li>• Köppl, Christine (authorised to take exams)</li></ul>
<b>Prerequisites</b>	
<b>Skills to be acquired in this module</b>	<p>+ Neurosci. knowlg. ++ Scient. Literature ++ Social skills + Interdiscipl. knowlg. ++ Data present./disc. + Scientific English ++ Ethics</p> <p>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.</p>
<b>Module contents</b>	<p>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:</p> <ul style="list-style-type: none"><li>• How to find literature?</li><li>• How to read different types of scientific papers: Classic papers, review papers, perspective papers, recent original papers?</li><li>• Publication process, Authorship and impact metrics</li><li>• Alternative publication paths and data sharing in neuroscience</li><li>• Science communication for the general public and on social media</li><li>• Face-to-face scientific communication</li></ul>
<b>Recommended reading</b>	<p>List of published papers, as well as online resources for preparation will be selected by the teachers and participants and announced via Stud.IP.</p> <p>Background neuroscience textbooks, e.g.:</p> <p>Galizia, Lledo 'Neuroscience – From Molecule to Behavior', 2013, Springer</p> <p>Nicholls et al. 'From Neuron to Brain', 5th edition 2012, Sinauer</p> <p>Kandel et al. 'Principles of Neural Science', 5th Edition 2013, McGraw-Hill Comp.</p>



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## Links

Related content: Science communication workshop:

[https://elearning.uni-oldenburg.de/dispatch.php/course/overview?cid=6fc0dbbf  
a53d7b3f5e3680f52ac7d0f7](https://elearning.uni-oldenburg.de/dispatch.php/course/overview?cid=6fc0dbbf<br/>a53d7b3f5e3680f52ac7d0f7)

<b>Language of instruction</b>	English	
<b>Duration (semesters)</b>	1 Semester	
<b>Module frequency</b>	winter semester	
<b>Module capacity</b>	20 ( Registration procedure / selection criteria: StudIP )	
<b>Type of module</b>	Wahlpflicht / Elective	
<b>Module level</b>	MM (Mastermodul / Master module)	
Examination	Prüfungszeiten	Type of examination
<b>Final exam of module</b>		Presentation (ungraded, pass / fail)
<b>Type of course</b>	Seminar	
<b>SWS</b>	2	
<b>Frequency</b>	WiSe	
<b>Workload attendance time</b>	28 h	

## neu800 - Introduction to Matlab

<b>Module label</b>	Introduction to Matlab			
<b>Module code</b>	neu800			
<b>Credit points</b>	3.0 KP			
<b>Workload</b>	90 h ( 2 SWS Supervised exercise (UE) "Introduction to MATLAB" Total workload 90h: 28h contact / 62h practising learned programming skills )			
<b>Applicability of the module</b>	<ul style="list-style-type: none"> <li>• Master's Programme Biology (Master) &gt; Skills Modules</li> <li>• Master's Programme Biology (Master) &gt; Skills Modules</li> <li>• Master's Programme Neuroscience (Master) &gt; Skills Modules</li> </ul>			
<b>Responsible persons</b>	<ul style="list-style-type: none"> <li>• Gießing, Carsten (module responsibility)</li> <li>• Gießing, Carsten (authorised to take exams)</li> </ul>			
<b>Prerequisites</b>				
<b>Skills to be acquired in this module</b>	<p>++ Expt. Methods + Social skills + Interdiscipl. knowlg. ++ Maths/Stats/Progr. + Data present./disc. + Scientific English</p> <p>Within this introductory course students will learn the basics of MATLAB programming. Participants will be introduced in fundamental programming concepts.</p>			
<b>Module contents</b>	The modul comprises an introduction to data structures, flow control, loops, graphics, basic data analyses with MATLAB, scripts and functions.			
<b>Recommended reading</b>	Recommended: Wallisch, Pascal (2014) MATLAB for neuroscientists: an introduction to scientific computing in MATLAB. 2. ed., Amsterdam: Elsevier.			
<b>Links</b>				
<b>Language of instruction</b>	English			
<b>Duration (semesters)</b>	1 Semester			
<b>Module frequency</b>	annually, summer term, second half			
<b>Module capacity</b>	25 (in total with bio640) ( shared course components with (cannot be credited twice): bio640 )			
<b>Examination</b>	<b>Prüfungszeiten</b>	<b>Type of examination</b>		
<b>Final exam of module</b>	end of summer term	Working on exercises Regular active participation		
<b>Type of course</b>	<b>Comment</b>	<b>SWS</b>	<b>Frequency</b>	<b>Workload of compulsory attendance</b>
Lecture			SuSe	0
Seminar			SuSe	0
Exercises		2	SuSe	28
<b>Total module attendance time</b>				28 h

## neu810 - International Meeting Contribution

<b>Module label</b>	International Meeting Contribution	
<b>Module code</b>	neu810	
<b>Credit points</b>	3.0 KP	
<b>Workload</b>	90 h	
<b>Applicability of the module</b>	<ul style="list-style-type: none"> <li>• Master's Programme Biology (Master) &gt; Skills Modules</li> <li>• Master's Programme Biology (Master) &gt; Skills Modules</li> <li>• Master's Programme Neuroscience (Master) &gt; Skills Modules</li> </ul>	
<b>Responsible persons</b>	<ul style="list-style-type: none"> <li>• Kretzberg, Jutta (module responsibility)</li> <li>• Kretzberg, Jutta (authorised to take exams)</li> <li>• Köppl, Christine (authorised to take exams)</li> </ul>	
<b>Prerequisites</b>		
<b>Skills to be acquired in this module</b>	<p>+ Neurosci. knowlg.            ++ Independent research            + Scient. Literature            ++ Social skills            + Interdiscipl. knowlg.            ++ Data present./disc.            + Scientific English            + Ethics</p> <p>Preparation, presentation and critical discussion of own studies for an international audience:</p> <ul style="list-style-type: none"> <li>• participate in an international meeting</li> <li>• prepare a poster or talk for an international meeting</li> <li>• present own results in a way that is appropriate for the target audience</li> <li>• put own studies into the context of scientific literature</li> <li>• acquire additional knowledge about a broader field of research</li> </ul>	
<b>Module contents</b>	<p>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.</p> <p>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.</p>	
<b>Recommended reading</b>	dependent on the scientific topic	
<b>Links</b>		
<b>Language of instruction</b>	English	
<b>Duration (semesters)</b>	1 Semester	
<b>Module frequency</b>	every semester, flexible	
<b>Module capacity</b>	unlimited ( please contact module organizer individually )	
<b>Type of module</b>	Wahlpflicht / Elective	
<b>Module level</b>	MM (Mastermodul / Master module)	
<b>Examination</b>	<b>Prüfungszeiten</b>	<b>Type of examination</b>
<b>Final exam of module</b>		presentation (ungraded, pass/fail)
<b>Type of course</b>	Seminar	
<b>SWS</b>	2	
<b>Frequency</b>	SuSe and WiSe	
<b>Workload attendance time</b>	28 h	

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## bio777 - Objects: Conserving, curating and communicating scientific Collections

<b>Module label</b>	Objects: Conserving, curating and communicating scientific Collections
<b>Module code</b>	bio777
<b>Credit points</b>	6.0 KP
<b>Workload</b>	180 h
<b>Applicability of the module</b>	<ul style="list-style-type: none"><li>• Master's Programme Biology (Master) &gt; Skills Modules</li><li>• Master's Programme Biology (Master) &gt; Skills Modules</li></ul>
<b>Responsible persons</b>	<ul style="list-style-type: none"><li>• Will, Maria (module responsibility)</li><li>• Albach, Dirk Carl (Module counselling)</li><li>• von Lindern, Klara (Module counselling)</li><li>• Will, Maria (authorised to take exams)</li><li>• von Lindern, Klara (authorised to take exams)</li></ul>
<b>Prerequisites</b>	
<b>Skills to be acquired in this module</b>	<ul style="list-style-type: none"><li>+deepened biological expertise</li><li>++deepened knowledge of biological working methods</li><li>++interdisciplinary thinking</li><li>+critical and analytical thinking</li><li>+independent searching and knowledge of scientific literature</li><li>+ability to perform independent biological research</li><li>+data presentation and discussion (written and spoken)</li><li>+teamwork</li><li>++ethics and professional behaviour</li><li>++project and time management</li></ul>
<b>Module contents</b>	<ul style="list-style-type: none"><li>- history of collections at universities and their importance for developing scientific theories;</li><li>- origin/formation of collections (objects in time and space)</li><li>- the collections of the CvO (overview) and their importance as infrastructure for teaching, learning and research</li><li>- collection work in biological collections such as botanical garden, natural history museums, didactical collections or the herbarium (concepts, object handling, conservation, documentation &amp; digitalization)</li><li>- developing research questions and projects based on objects/collections, e.g., provenance research</li><li>- communicating object-based topics (e.g., speed talk presenting current scientific articles)</li></ul>
<b>Recommended reading</b>	articles and book chapters referring to (1) the history/presence/future of collections, (2) collection management and (3) research projects based on objects/collections
<b>Links</b>	<a href="https://uol.de/kustodien/zertifikatsprogramm">https://uol.de/kustodien/zertifikatsprogramm</a>
<b>Languages of instruction</b>	German, English
<b>Duration (semesters)</b>	1 Semester
<b>Module frequency</b>	Winter term
<b>Module capacity</b>	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)

## Type of course

Comment

SWS

Frequency

Workload of compulsory  
attendance

Lecture

1

WiSe

14

Seminar

2

WiSe

28

Exercises

1

WiSe

14

**Total module attendance time**

56 h

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## bio783 - Object-based Research Projects in Biological Collections

<b>Module label</b>	Object-based Research Projects in Biological Collections
<b>Module code</b>	bio783
<b>Credit points</b>	6.0 KP
<b>Workload</b>	180 h
<b>Applicability of the module</b>	<ul style="list-style-type: none"><li>• Master's Programme Biology (Master) &gt; Skills Modules</li><li>• Master's Programme Biology (Master) &gt; Skills Modules</li></ul>
<b>Responsible persons</b>	<ul style="list-style-type: none"><li>• Will, Maria (module responsibility)</li><li>• Albach, Dirk Carl (Module counselling)</li><li>• Will, Maria (authorised to take exams)</li></ul>
<b>Prerequisites</b>	

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### 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

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### 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

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### Recommended reading

scientific literature corresponding to the individual research project

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### Links

<b>Language of instruction</b>	English
<b>Duration (semesters)</b>	1 Semester
<b>Module frequency</b>	irregular
<b>Module capacity</b>	4
<b>Reference text</b>	

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.

<b>Type of module</b>	Wahlmodul / Opportunity	
<b>Module level</b>	MM (Mastermodul / Master module)	
<b>Teaching/Learning method</b>	Exercise	
Examination	Prüfungszeiten	Type of examination
<b>Final exam of module</b>	individual	1 Portfolio
<b>Type of course</b>	Exercises	
<b>SWS</b>	4	
<b>Frequency</b>	WiSe	
<b>Workload attendance time</b>	56 h	

## neu820 - Neuroscience Journal Club

<b>Module label</b>	Neuroscience Journal Club	
<b>Module code</b>	neu820	
<b>Credit points</b>	3.0 KP	
<b>Workload</b>	90 h ( 30h contact / 60h reading and preparation of oral and poster presentation )	
<b>Applicability of the module</b>	<ul style="list-style-type: none"> <li>• Master's Programme Biology (Master) &gt; Skills Modules</li> <li>• Master's Programme Biology (Master) &gt; Skills Modules</li> <li>• Master's Programme Neuroscience (Master) &gt; Skills Modules</li> </ul>	
<b>Responsible persons</b>	<ul style="list-style-type: none"> <li>• Mertsch, Sonja (module responsibility)</li> <li>• Mertsch, Sonja (authorised to take exams)</li> </ul>	
<b>Prerequisites</b>		
<b>Skills to be acquired in this module</b>	<p>Students will learn to read, interpret, present and discuss neuroscientific literature.</p> <p>++ Neurosci. knowledge + Expt. Methods ++ Scient. Literature ++ Social skills + Interdiscipl. knowledge ++ Data present./disc. + Scientific English + Ehtics</p>	
<b>Module contents</b>	<p>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</p> <p>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.</p>	
<b>Recommended reading</b>	Scientific literature will be available in Stud.IP	
<b>Links</b>		
<b>Language of instruction</b>	English	
<b>Duration (semesters)</b>	1 Semester	
<b>Module frequency</b>	winter term, annually	
<b>Module capacity</b>	20	
<b>Examination</b>	<b>Prüfungszeiten</b>	<b>Type of examination</b>
<b>Final exam of module</b>	during the semester	presentation and attendance of at least 70% in the seminars
<b>Type of course</b>	Seminar	
<b>SWS</b>	2	
<b>Frequency</b>	SuSe and WiSe	
<b>Workload attendance time</b>	30 h	



# Abschlussmodul

## mam - Master's Thesis Module

<b>Module label</b>	Master's Thesis Module	
<b>Module code</b>	mam	
<b>Credit points</b>	30.0 KP	
<b>Workload</b>	900 h	
<b>Applicability of the module</b>	<ul style="list-style-type: none"> <li>• Master's Programme Biology (Master) &gt; Abschlussmodul</li> </ul>	
<b>Responsible persons</b>	<ul style="list-style-type: none"> <li>• der Biologie, Lehrende (authorised to take exams)</li> </ul>	
<b>Prerequisites</b>		
<b>Skills to be acquired in this module</b>	<p>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.</p> <ul style="list-style-type: none"> <li>++ deepened biological expertise</li> <li>++ deepened knowledge of biological working methods</li> <li>++ data analysis skills</li> <li>++ critical and analytical thinking</li> <li>+ independent searching and knowledge of scientific literature</li> <li>++ ability to perform independent biological research</li> <li>++ data presentation and discussion in German and English (written and spoken)</li> <li>+ teamwork</li> <li>+ ethics and professional behaviour</li> <li>++ project and time management</li> </ul>	
<b>Module contents</b>	<p>Preparing the Master thesis Active participation in the seminar of the research group, in which the Master thesis is written</p>	
<b>Recommended reading</b>	<p>Supervisors may supply an initial reading list with important literature. The students are expected to find and use further literature as needed.</p>	
<b>Links</b>		
<b>Languages of instruction</b>	English , German	
<b>Duration (semesters)</b>	1 Semester	
<b>Module frequency</b>	semiannual	
<b>Module capacity</b>	unlimited	
<b>Examination</b>	<b>Prüfungszeiten</b>	<b>Type of examination</b>
<b>Final exam of module</b>		master's thesis (90%) Final colloquium (10%)
<b>Type of course</b>	Seminar	
<b>SWS</b>	2	
<b>Frequency</b>	SuSe and WiSe	
<b>Workload attendance time</b>	28 h	

