Modules for Biology

Background Modules

bio703 - Basic Concepts in Plant Sciences

<table>
<thead>
<tr>
<th>Module label</th>
<th>Basic Concepts in Plant Sciences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Module code</td>
<td>bio703</td>
</tr>
<tr>
<td>Credit points</td>
<td>12.0 KP</td>
</tr>
<tr>
<td>Workload</td>
<td>360 h</td>
</tr>
<tr>
<td>Used in course of study</td>
<td>Master Biologie &gt; Background Modules</td>
</tr>
<tr>
<td>Contact person</td>
<td>Module responsibility</td>
</tr>
<tr>
<td></td>
<td>• Dirk Carl Albach</td>
</tr>
<tr>
<td>Authorized examiners</td>
<td>Gerhard Wolfgang Zotz</td>
</tr>
<tr>
<td></td>
<td>Sascha Laubinger</td>
</tr>
<tr>
<td></td>
<td>Klaus Bernhard von Hagen</td>
</tr>
<tr>
<td>Module counseling</td>
<td>Gerhard Wolfgang Zotz</td>
</tr>
<tr>
<td></td>
<td>Sascha Laubinger</td>
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<tr>
<td></td>
<td>Klaus Bernhard von Hagen</td>
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</tbody>
</table>

### Entry requirements

Skills to be acquired in this module

- Communicating deeper knowledge in ecology, phylogeny, evolution and genetics of plants
- Communicating scale- and method-overarching thinking
- Communicating deeper theoretic concepts of ecology, evolution and genetics of plants
- ++ deepened biological expertise
- + deepened knowledge of biological working methods
- + data analysis skills
- + interdisciplinary thinking
- ++ critical and analytical thinking
- ++ independent searching and knowledge of scientific literature
- + ability to perform independent biological research
- ++ data presentation and discussion in German and English (written and spoken)
- + teamwork
- ++ ethics and professional behaviour

### Module contents

- V: Biodiversity of plants (2 SWS)
- V: Resource acquisition and use by plants (1 SWS)
- V: Gene expression in plants (1 SWS)
- S: Phylogeny of plants (2 SWS)
- S: Interactions of plants with environmental parameters (2SWS)

**Reader's advisory**


### Links

**Languages of instruction**

- German, English

**Duration (semesters)**

- 1 Semester

**Module frequency**

- 12

**Reference text**

- associated with bio765 (Current Methods in Plant Science) (recommended)

**Modullevel**

- MM (Mastermodul / Master module)

**Modulart**

- je nach Studiengang Pflicht oder Wahlpflicht

**Vorkenntnisse / Previous knowledge**

- Ecology, Flora, Genetics

**Examination**

- Time of examination: Not specified
- Type of examination: Not specified

**Final exam of module**

- 1 Portfolio (40%), 1 report (60%)

**Course type**

- Comment
- SWS
- Frequency
- Workload attendance
<table>
<thead>
<tr>
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<th>SWS</th>
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<tbody>
<tr>
<td>Lecture</td>
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<td><strong>Total time of attendance for the module</strong></td>
<td></td>
<td></td>
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<td><strong>112 h</strong></td>
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</table>
### bio765 - Current Methods in Plant Sciences - Ecology, Phylogeny and Molecular Biology

<table>
<thead>
<tr>
<th>Module label</th>
<th>Current Methods in Plant Sciences - Ecology, Phylogeny and Molecular Biology</th>
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<tr>
<td>Module code</td>
<td>bio765</td>
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<td>Master Biologie &gt; Background Modules</td>
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**Contact person**

- Module responsibility
  - Sascha Laubinger
- Authorized examiners
  - Sascha Laubinger
  - Dirk Carl Albach
  - Gerhard Wolfgang Zotz
- Module counseling
  - Dirk Carl Albach
  - Gerhard Wolfgang Zotz

**Entry requirements**

- Acquaintance and practicing ecological, phylogenetic and molecular methods
- Communication of scale- and method-overarching thinking and project planning
- Knowledge of current methods and questions in plant science
- Capacity for teamwork, project- and time management
- Deepened biological expertise
- Deepened knowledge of biological working methods
- Data analysis skills
- Interdisciplinary thinking
- Critical and analytical thinking
- Independent searching and knowledge of scientific literature
- Ability to perform independent biological research
- Data presentation and discussion in German and English (written and spoken)
- Teamwork
- Statistics & scientific programming

**Module contents**

- Ü: Current Methods in Plant Science (8 SWS)

**Reader's advisory**

- Languages of instruction: German, English
- Duration (semesters): 1 Semester

**Module frequency**

- Module capacity: 12
- Reference text: associated with bio703 (Basic Concepts in Plant Sciences) (recommended)
- Modullevel: MM (Mastermodul / Master module)
- Modulart: je nach Studiengang Pflicht oder Wahlpflicht

**Lern- / Lehrform / Type of program**

**Vorkenntnisse / Previous knowledge**

- Ecology, Flora, Genetics

**Examination**

- Time of examination
- Type of examination
- Final exam of module: Portfolio

**Course type**

- Exercises

**SWS**

- 8.00

**Frequency**

- WiSe

**Workload attendance**

- 112 h
bio655 - Ornithology

Module label  Ornithology
Module code  bio655
Credit points  12.0 KP
Workload  360 h

Used in course of study  • Master Biologie > Background Modules

Contact person

Module responsibility
  » Franz Bairlein

Authorized examiners
  » Georg Martin Klump
  » Sandra Bouwhuis
  » Christine Köppl
  » Ulrike Langemann
  » Henrik Mouritsen
  » Heiko SchmaJohann
  » Franz Bairlein

Module counseling
  » Georg Martin Klump
  » Sandra Bouwhuis
  » Christine Köppl
  » Ulrike Langemann
  » Henrik Mouritsen
  » Heiko SchmaJohann
  » Franz Bairlein

Entry requirements

Skills to be acquired in this module
  The module imparts advanced knowledge on different aspects of ornithology. The students acquire:
  
  • An extended knowledge of morphological 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
  ++ deepened biological expertise
  + deepened knowledge of biological working methods
  + critical and analytical thinking
  + independent searching and knowledge of scientific literature
  ++ data presentation and discussion in German and English (written and spoken)

Module contents

The module is composed of the lecture “Ecology and Physiology of Birds”, a seminar accompanying the lecture “Current Questions of Ornithology”, a seminar “Behavioural Ecology of Birds”, and a seminar “Methods in Field Ornithology”.

Lecture “Ecology and Physiology of Birds”:
This lecture consolidates special aspects of systematics, morphology, physiology, migration, orientation, population biology, communication and behavioural ecology in 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 treated in the lecture. Every student reads a paper on one scientific article 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.

Reader's advisory

bio770 - Field Methods in Organismal Biology

Module label: Field Methods in Organismal Biology
Module code: bio770
Credit points: 15.0 KP
Workload: 450 h

Used in course of study: Master Biologie > Background Modules

Contact person
Module responsibility
- Gerhard Wolfgang Zotz

Authorized examiners
- Gerhard Wolfgang Zotz
- Gabriele Gerlach
- Dirk Carl Albach
- Thomas Glatzel
- Klaus Bernhard von Hagen
- Henrik Mouritsen

Module counseling
- Gabriele Gerlach
- Dirk Carl Albach
- Thomas Glatzel
- Klaus Bernhard von Hagen
- Henrik Mouritsen

Entry requirements

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)
- project and time management
- statistics & scientific programming

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).

Module contents
S: Biogeographic and ecological classification and characterization of a biome (e.g. Mediterranean region, moist tropics, boreal zone), independent identification and treatment of scientific questions, presentation of scientific results in a “mini symposium” subsequent to the field studies.
E: Planning and performing a field study project, data analysis, written report in the form of a scientific publication

Reader’s advisory
Varies with topic and field locality

Links
www.uni-oldenburg.de/fun_eco/

Languages of instruction
German, English

Duration (semesters)
1 Semester

Module frequency
jährlich

Module capacity
21

Modullevel
MM (Mastermodul / Master module)

Modulart
Pflicht / Mandatory

Lern-/Lehrform / Type of program

Vorkenntnisse / Previous knowledge

Examination
Time of examination
Type of examination
Final exam of module
Presentation(s) (30 %)
Laboratory course report on project work (70 %)

Course type
Comment
SWS
Frequency
Workload attendance
Exercises
10.00
SuSe
140 h
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<th>Comment</th>
<th>SWS</th>
<th>Frequency</th>
<th>Workload attendance</th>
</tr>
</thead>
<tbody>
<tr>
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<td></td>
<td>2.00</td>
<td>SuSe</td>
<td>28 h</td>
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<td>0.00</td>
<td>WiSe</td>
<td>0 h</td>
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Total time of attendance for the module 168 h
bio720 - Marine Biodiversity

Module label Marine Biodiversity
Module code bio720
Credit points 15.0 KP
Workload 450 h
Used in course of study
- Master Biologie > Background Modules

Contact person
Module responsibility
- Pedro-Miguel Martinez-Arbizu
Authorized examiners
- Pedro-Miguel Martinez-Arbizu
- Thomas Glatzel
Module counseling
- Thomas Glatzel

Entry requirements
BSc (Biology)

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
+ statistics & scientific programming

Knowledge of fundamentals, topical subjects and methods in Marine Biology and Marine Geology. Studies and critical assessment of the scientific literature.

Module contents
L: (AW) General Marine Geology
E: Biogenic sedimentation, Interaction benthos-sediment; (SS) Plankton of the oceans; (MH) unicellular plankton; (IK) benthos of the North-Sea; (PM) biodiversity in the deep sea and on sea-mountains; (JG) conceptions and hypotheses of marine biodiversity, biodiversity of marine vertebrates; (GG) animal migrations and dispersal behaviour.

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.

Reader's advisory
as announced in the lecture

Links
Language of instruction German
Duration (semesters) 1 Semester
Module frequency jährlich
Module capacity unlimited
Modulelevel MM (Mastermodul / Master module)
Modulart Wahlpflicht / Elective

Vorkenntnisse / Previous knowledge

Examination Time of examination Type of examination
Final exam of module
Written examination (60 %)
Presentation(s) (40 %)
Regular active participation is required for the module to be passed.

Course type Comment SWS Frequency Workload attendance
Lecture 3.00 WiSe 42 h
Exercises 9.00 WiSe 126 h
<table>
<thead>
<tr>
<th>Course type</th>
<th>Comment</th>
<th>SWS</th>
<th>Frequency</th>
<th>Workload attendance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seminar</td>
<td></td>
<td>1.00</td>
<td>WiSe</td>
<td>14 h</td>
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**Total time of attendance for the module** 182 h
bio780 - Biodiversity of Littoral Communities

Module label: Biodiversity of Littoral Communities
Module code: bio780
Credit points: 15.0 KP
Workload: 450 h

Used in course of study
- Master Biologie > Background Modules

Contact person
Module responsibility
- Thomas Glatzel
Authorized examiners
- Thomas Glatzel
- Pedro-Miguel Martinez-Arbizu
Module counseling
- Pedro-Miguel Martinez-Arbizu

Entry requirements
Safe apnoediving with aptitude test and medical fitness certificate

Skills to be acquired in this module
- deepened knowledge of biological working methods
- ability to perform independent biological research
- teamwork
- ethics and professional behaviour
- project and time management

By actively participating in this module students acquire qualifications in the following fields:
Biological oceanography, marine biology and marine ecology:
- Geological formation history of the Mediterranean Sea and Atlantic Ocean, respectively, or the Red Sea and adjacent seas
- Oceanography and hydrology
- Development of the faunal and floral composition of the Atlantic Ocean, the Mediterranean Sea and the Mediterranean region or the Red Sea (biogeography)
- Commercial utilization of the seas and its impacts
- Biotopes and biotic communities
- Evolution, systematics, morphology, modes of life, and ecology of selected animal groups
- Applying theoretical knowledge to real-world organisms/systems
- Improved and specialized knowledge of species
- Adaptation of life cycles
- Interaction between organisms and environment
- Dynamics of reef-building and reef-degrading processes
- Threat to coral reefs/protection of marine environments

Methods:
- Formulation and definition of scientific approaches and selection of methods
- Observation and investigation of organisms and their habitats (snorkelling/diving)
- Documentation of small research projects in groups in the style of a scientific publication
- Editorial work to prepare a module report
- Popular presentation of results to be published by the media and to be presented at the University

Further skills:
- Social engagement in groups/teamwork in projects
- Independent scientific work in groups
- Improvement of scientific discussion culture
- Consciousness of the threat to coral reefs
- Practising English
- Dealing with the culture of the visited region

Culture:
- History, culture, politics, and religion

Additionally:
- Physiological aspects of apnoediving
- Measures in case of accidents (also caused by "poisonous" organisms)
Module contents

Biodiversity of littoral biotic communities – topographical field research

Reader's advisory

GRÜTER, W., 2001: Leben im Meer - Vielfalt und Zusammenhänge. Dr. Friedrich Pfeil Verlag, München.  
Shoul be read prior to a marine biological excursion! This book will arouse your curiosity about the submarine world. A reading book!

This textbook is information and fun for all readers interested in marine life as well as in the protection of marine environments.

The textbook for the Mediterranean Sea! The general 1st part provides valuable information on symbioses or feeding types, for example.

Very compact, explanatory! Not expensive! A must for biological oceanography! Recommended for preparing examinations! Provides basic information!

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.

Connecting biological oceanography with theoretical ecology!

Literature study:

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

Links

Language of instruction

German

Duration (semesters)

1 Semester

Module frequency

jährlich

Module capacity

unlimited

Modullevel

MM (Mastermodul / Master module)

Modulart

Wahlpflicht / Elective

Vorkenntnisse / Previous knowledge

Examinaition Time of examination Type of examination

Final exam of module during the lectures  
1. Report(s) (30 %)  
2. Assignment (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.

Course type Comment SWS Frequency Workload attendance

Exercises 9.00 SuSe 126 h

Seminar 3.00 SuSe 42 h

Seminar 0.00 WiSe 0 h

Total time of attendance for the module 168 h
bio733 - Evolutionary Biology Population Genetics

Module label: Evolutionary Biology Population Genetics
Module code: bio733
Credit points: 6.0 KP
Workload: 180 h
Used in course of study: Master Biologie > Background Modules

Contact person:
- Module responsibility
  - Gabriele Gerlach
- Authorized examiners
  - Gabriele Gerlach
  - Dirk Carl Albach
- Module counseling
  - Dirk Carl Albach

Entry requirements: none

Skills to be acquired in this module

Module contents

Reader's advisory

Links

Languages of instruction: German, English
Duration (semesters): 1 Semester

Module frequency: 12
Reference text: associated with bio736 (Evolutionary Transcriptomics) (recommended)

Modullevel: MM (Mastermodul / Master module)
Modulart: Wahlpflicht / Elective

Lern-/Lehrform / Type of program

Vorkenntnisse / Previous knowledge: Evolutionary biology

Examination:

<table>
<thead>
<tr>
<th>Examination</th>
<th>Time of examination</th>
<th>Type of examination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Final exam of module</td>
<td>portfolio (60%) presentation (40%)</td>
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<table>
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<tr>
<th>Course type</th>
<th>Comment</th>
<th>SWS</th>
<th>Frequency</th>
<th>Workload attendance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecture</td>
<td></td>
<td>1.00</td>
<td>WiSe</td>
<td>14 h</td>
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<tr>
<td>Exercises</td>
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<td>3.00</td>
<td>WiSe</td>
<td>42 h</td>
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Total time of attendance for the module: 56 h
Module label: Evolutionary Transcriptomics
Module code: bio736
Credit points: 6.0 KP
Workload: 180 h
Used in course of study: Master Biologie > Background Modules

Contact person
Module responsibility
- Arne Nolte
Authorized examiners
- Arne Nolte
- Sascha Laubinger
- Udo Gowik
Module counseling
- Sascha Laubinger
- Udo Gowik

Entry requirements: none
Skills to be acquired in this module:
- + deepened biological expertise
- ++ deepened knowledge of biological working methods
- ++ data analysis skills; ++ critical and analytical thinking
- + independent searching and knowledge of scientific literature
- ++ data presentation and discussion in English (written and spoken)
- ++ statistics & scientific programming

Module contents: Lecture: Gene expression represents the first step of the translation of genomic information into a phenotype. This phenotype is of broad interest in all disciplines of biology. Gene expression data can reveal how genetic changes at single genes manifest phenotypically and how gene expression is regulated. The same data can also explain differences in life history and adaptation to different environments. Different perspectives can be understood by studying mechanisms of gene regulation as well as broad scale transcriptomics analyses.

Exercise: We will generate and analyze gene expression data during the course including wet lab and computational methods. Practicals include the analysis of single-gene expression data as well as RNAseq data representing complete transcriptomes.

Reader's advisory
Links
Languages of instruction: German, English
Duration (semesters): 1 Semester
Module frequency: 12
Module capacity: 12
Reference text: associated with bio733: Evolutionary Biology Population Genetics (recommended)
Modullevel: MM (Mastermodul / Master module)
Modalart: Wahlpflicht / Elective

Lern-/Lehrform / Type of program
Vorkenntnisse / Previous knowledge: Evolutionary Biology

Examination
Type of examination
Final exam of module portfolio (60%)
presentation (40%)

Course type Comment SWS Frequency Workload attendance
Lecture
1.00 WiSe 14 h
Exercises
3.00 WiSe 42 h
Total time of attendance for the module 56 h
## bio675 - Molecular Ecology

<table>
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<tr>
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<th>Molecular Ecology</th>
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<td><strong>Workload</strong></td>
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<tr>
<td><strong>Used in course of study</strong></td>
<td>Master Biologie &gt; Background Modules</td>
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### Contact person
- Module responsibility
  - Arne Nolte
- Authorized examiners
  - Arne Nolte
  - Gabriele Gerlach
- Module counseling
  - Gabriele Gerlach

### Entry requirements
B.Sc. (Biologie, Umweltwissenschaften)
M.Sc. (Biologie, Marine Umweltwissenschaften, Landschaftsökologie)

### 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)
- + statistics & scientific programming

### Module contents
- Lecture: AN/GG - Molecular ecology background of specific study systems. The lectures will introduce a study system that will be analyzed during the course (study systems may vary from year to year). It is the goal of the lecture to provide students with background information to develop an experimental design of a field study during the practical.
- 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.

### Reader's advisory
will be announced during the course

### Links
- **Languages of instruction**: German, English
- **Duration (semesters)**: 1 Semester
- **Module frequency**: 15
- **Reference text**: associated with bio890 Current Topics of Biology (Seminar)
- **Modullevel**: MM (Mastermodul / Master module)
- **Modulart**: Wahlpflicht / Elective

### Vorkenntnisse / Previous knowledge
- Reading of scientific literature in english and the ability to present a seminar topic in English. Basic skills in working in the genetics lab and with a computer.

### Examination
- **Final exam of module**: during the module
- Präsentationen (50%), Portfolio (50%). Regular participation is a prerequisite to pass in the module.

### Course type
<table>
<thead>
<tr>
<th>Course type</th>
<th>Comment</th>
<th>SWS</th>
<th>Frequency</th>
<th>Workload attendance</th>
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<tbody>
<tr>
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<td>Exercises</td>
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<td>SuSe</td>
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<td>Workload attendance</td>
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<td></td>
<td></td>
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<td>112 h</td>
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# bio605 - Molecular Genetics and Cell Biology

<table>
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<th>Molecular Genetics and Cell Biology</th>
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<tbody>
<tr>
<td><strong>Module code</strong></td>
<td>bio605</td>
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<tr>
<td><strong>Credit points</strong></td>
<td>12.0 KP</td>
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<tr>
<td><strong>Workload</strong></td>
<td>360 h</td>
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| **Used in course of study** | Master Biologie > Background Modules  
Master Neuroscience > Background Modules |

## Contact person
- **Module responsibility**
  - John Neidhardt
- **Authorized examiners**
  - John Neidhardt
  - Karl-Wilhelm Koch
  - Kathrin Thedieck
- **Module counseling**
  - Karl-Wilhelm Koch
  - Kathrin Thedieck

### Entry requirements
- **Skills to be acquired in this module**
  - ++ deepened biological expertise
  - ++ deepened knowledge of biological working methods
  - ++ data analysis skills
  - ++ interdisciplinary thinking
  - critical and analytical thinking
  - independent searching and knowledge of scientific literature
  - data presentation and discussion in German and English (written and spoken)
  - teamwork
  - ethics and professional behaviour
  - project and time management
- Addressing students with an emphasis on molecular biology, molecular genetics, cell biology, and neurobiology

## Module contents
- **Lecture:** To improve knowledge in molecular genetics, molecular biology and cell biology in correlation with human diseases.
- **Exercise:** Learn to transfer the theoretical knowledge to experiments. Gaining methodological knowledge in molecular genetics, cell biology and therapeutic approaches. Initial training on how to perform research projects.
- **Subjects of the lecture and seminar:** Molecular bases of neurodegenerative diseases, structure and function of DNA/RNA/proteins/membranes, cytoskeleton, cell cycle, programmed cell death, cells in the social structure.
- **Exercises:** Learning current methods of molecular biology and human genetics; high throughput technologies, introduction to cell cultivation techniques.

### Reader’s advisory
- **Textbooks of Cell Biology**
- **Links**
  - [http://www.uni-oldenburg.de/humangenetik/](http://www.uni-oldenburg.de/humangenetik/)

### Language of instruction
- **English**

### Duration (semesters)
- **1 Semester**

### Module frequency
- **Module capacity**
  - 15
- **Reference text**
  - associated with bio900

## Modullevel
- **MM (Mastermodul / Master module)**

## Lern-/Lehrform / Type of program
- **Wahlpflicht / Elective**

### Vorkenntnisse / Previous knowledge

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

<table>
<thead>
<tr>
<th><strong>Course type</strong></th>
<th><strong>Comment</strong></th>
<th><strong>SWS</strong></th>
<th><strong>Frequency</strong></th>
<th><strong>Workload attendance</strong></th>
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<td>Frequency</td>
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<tr>
<td>Seminar</td>
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<td>WiSe</td>
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<td>Exercises</td>
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<td>5.00</td>
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**Total time of attendance for the module**

112 h
# bio845 - Introduction to Development and Evolution

<table>
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<tr>
<td>Module code</td>
<td>bio845</td>
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<tr>
<td>Credit points</td>
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<tr>
<td>Workload</td>
<td>180 h</td>
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</table>
| Used in course of study | • Master Biologie > Background Modules  
                          | • Master Neuroscience > Background Modules                  |
| Contact person        | Module responsibility                                     |
|                       | • Ulrike Sienknecht                                       |
|                       | Authorized examiners                                      |
|                       | • Ulrike Sienknecht                                       |
|                       | • Maike Claußen                                           |
|                       | Module counseling                                         |
|                       | • Maike Claußen                                           |

## Entry requirements

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 organo-genesis
- know the principles of gene regulatory networks in development and are able to explain examples
- are able to explain and discuss mechanisms of development across taxonomic groups and questions about the evolution of developmental mechanisms
- have in-depth knowledge of the development of animal nervous systems, including cellular and net-work properties

### skills:

- ++ deepened biological expertise
- + deepened knowledge of biological working methods
- ++ interdisciplinary thinking
- ++ critical and analytical thinking
- + independent searching and knowledge of scientific literature
- + ability to perform independent biological research
- + teamwork

## Module contents

Lectures on the fundamentals and concepts of developmental biology, including evolutionary aspects. Parallel seminars matching the topics of the lectures and emphasizing discussion.

- 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
- Limb Development
- Developmental Mechanisms of Evolutionary Change
- Model Organisms in Developmental Biology
- Transgenic Mice
- Medical Implications of Developmental Biology

## Reader's advisory

**Literature:**


## Links

- **Language of instruction**: English
- **Duration (semesters)**: 1 Semester
- **Module frequency**: 20 (selection criteria: sequence of registration)
**Reference text**
associated with bio846 (previously neu120) (Lab Exercises in Development and Evolution)

**Modullevel**
MM (Mastermodul / Master module)

**Modulart**
Wahlpflicht / Elective

**Lern-/Lehrform / Type of program**

<table>
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<tr>
<th>Vorkenntnisse / Previous knowledge</th>
<th>organismic biology, developmental biology, evolutionary biology, neurobiology, genetics, molecular biology</th>
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**Examination**

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<td>Seminar</td>
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<td>28 h</td>
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**Total time of attendance for the module**
56 h
bio846 - Lab Exercises in Development and Evolution

Module label: Lab Exercises in Development and Evolution
Module code: bio846
Credit points: 6.0 KP
Workload: 180 h
Used in course of study:
- Master Biologie > Background Modules
- Master Neuroscience > Background Modules

Contact person:
Module responsibility: Ulrike Sienknecht
Authorized examiners:
- Ulrike Sienknecht
- Hans Gerd Nothwang
Module counseling:
- Hans Gerd Nothwang

Entry requirements:

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 embryo handling, tissue preparation (including cryosectioning), dissection of inner ears, and the use of different histological 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 note-book
- know how to carry out formal laboratory reports (and the anatomy of a scientific paper)
- and in addition, 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 in German and English (written and spoken)
++ teamwork
+ ethics and professional behaviour
++ project and time management

Module contents:
Lab exercises in comparative developmental biology on 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.

Lectures in the field of auditory system development, such as:
- Development of the Inner Ear
- Development of the Middle Ear
- Evolution of the Central and Peripheral Auditory System
- Development and Layout of the Central Auditory System

Reader's advisory:

Links:

Language of instruction: English
Duration (semesters): 1 Semester
Module frequency: 
Module capacity: 6 (selection criteria: sequence of registration)
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## bio860 - Comparative Developmental Biology

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### Contact person

- Module responsibility
  - Ulrike Sienknecht
- Authorized examiners
  - Ulrike Sienknecht
- Module counseling
  - N. N.

### Entry requirements

#### Skills to be acquired in this module

- deepened biological knowledge
- deepened knowledge of techniques in biology
- knowledge in data analysis and presentation
- cross-disciplinary knowledge and thinking
- critical and analytical thinking
- independent searching and knowledge of scientific literature
- ability to perform independent biological research
- team work
- ethics and professional behaviour
- project and time management

### Module contents

Lectures and Lab exercises in topics of evolutionary developmental biology, i.e. comparative developmental biology, such as the development of sensory systems in different species.

### Reader's advisory


### Links

- Language of instruction: English
- Duration (semesters): 1 Semester
- Module frequency: 
- Module capacity: 6
- Reference text: associated with bio845 Introduction to Development and Evolution
- Modullevel: MM (Mastermodul / Master module)
- Modulart: Wahlpflicht / Elective

### Lern-/Lehrform / Type of program

Vorkenntnisse / Previous knowledge
- organismic biology, experience with lab work

### Examination

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### Total time of attendance for the module

56 h
### bio695 - Biochemical concepts in signal transduction

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<td>Karl-Wilhelm Koch</td>
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<td>Alexander Scholten</td>
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<td></td>
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<td>++ deepened knowledge of biological working methods</td>
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<td>++ data analysis skills</td>
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<td>+ interdisciplinary thinking</td>
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<td>++ critical and analytical thinking</td>
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<td>+ independent searching and knowledge of scientific literature</td>
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<td></td>
<td>++ data presentation and discussion in German and English (written and spoken)</td>
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<td>+ teamwork</td>
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<td>+ project and time management</td>
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<td>Module contents</td>
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<td>Seminar: Signal transduction</td>
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<td>Exercises: Experiments on cellular signal transduction and enzymology</td>
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<td></td>
<td>Mechanisms of biochemical signal transduction are imparted theoretically and experimentally</td>
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<td>Textbooks of cell biology and biochemistry. Current literature on topics of signal transduction (as announced in the preparatory meeting).</td>
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<tr>
<td>Vorkenntnisse / Previous knowledge</td>
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<tr>
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<tr>
<td>6.00</td>
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<td>84 h</td>
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<tr>
<td></td>
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<td>112 h</td>
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neu210 - Neurosensory Science and Behaviour - Part A

Module label
Neurosensory Science and Behaviour - Part A

Module code
neu210

Credit points
9.0 KP

Workload
270 h

Used in course of study
- Master Biologie > Background Modules
- Master Neuroscience > Background Modules

Contact person
Module responsibility
- Georg Martin Klump

Authorized examiners
- Alle hier genannten

Module counseling
- Ulrike Langemann
- Jannis Hildebrandt
- Henrik Mouritsen

Entry requirements

Skills to be acquired in this module
++ Neurosci. knowlg. + Expt. methods + Independent research + Scient. literature + Social skills
++ Interdiscipl. knowlg. Maths/Stats/Progr. + Data present./disc. + Scientific English Ethics

Upon successful completion of this course, students
- know the fundamentals of behavioural ecology and neuroethology
- are able to present and critically assess scientific data and approaches

Module contents
The lecture “Neuroethology” provides an introduction to the mechanisms underlying the behaviour of animals. Subjects are, e.g., the mechanisms of perception, control of movement patterns, mechanisms of learning, orientation and navigation.

The lecture “Behavioural ecology” provides an introduction to topics such as predator-prey interactions, optimal food utilization, spatial and temporal distribution of animals, social relations and group formation, mating systems and reproductive strategies, sexual selection, investment of parents in offspring, and communication.

In the seminar “Current issues of Ethology”, current original literature relating to behavioural biology is reported and discussed.

Reader’s advisory

Links

Language of instruction
English

Duration (semesters)
1 Semester

Module frequency
jährlich

Module capacity
30

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

Modullevel
---

Modulart
je nach Studiengang Pflicht oder Wahlpflicht

Lern-/Lehrform / Type of program

Vorkenntnisse / Previous knowledge

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

Course type
Comment
SWS
Frequency
Workload attendance
Lecture
4.00
56 h
Seminar
2.00
28 h

Total time of attendance for the module
84 h
neu220 - Neurosensory Science and Behaviour - Part B

Module label: Neurosensory Science and Behaviour - Part B
Module code: neu220
Credit points: 6.0 KP
Workload: 180 h
Used in course of study:
- Master Biologie > Background Modules
- Master Neuroscience > Background Modules

Contact person:
Module responsibility
- Christiane Margarete Thiel
Authorized examiners
- Alle hier genannten
Module counseling
- Carsten Gießing

Entry requirements:
Skills to be acquired in this module:
++ Neurosci. knowlg. + Expt. methods Independent research + Scient. literature + Social skills
++ Interdiscipl. knowlg. Maths/Stats/Progr. + Data present./disc. + Scientific English Ethics

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

Module contents:
The lecture "Introduction to Cognitive Neuroscience" gives a short introduction into neuroanatomy and cognitive neuroscience methods and then covers different cognitive functions.
Lecture topics:
- History of cognitive neuroscience
- Methods of cognitive neuroscience
- Attention
- Learning
- Emotion
- Language
- Executive functions.
The supervised excersise either deepens that knowledge by excersises or discussions of recent papers/ talks on the respective topic covered during that week.
The lecture “Psychopharmacology” illustrates the connection between neurotransmitters and behaviour and its links to psychiatric disease.
The lecture contains several interactive parts to consolidate and critically evaluate the acquired knowledge.
Lecture topics:
- Introduction to Terms and Definitions in Drug Research
- Dopaminergic and Noradrenergic System
- Cholinergic and Serotonergic System
- GABAergic and Glutamatergic System
- Addiction
- Depression
- Schizophrenia
- Anxiety
- Alzheimer's Disease

Reader's advisory:

Links:
Language of instruction: English
Duration (semesters): 1 Semester
Module frequency: jährlich
Module capacity: 30
**Reference text**
Course in the second half of the semester
Regular active participation is required to pass the module.

**Modullevel**
---

**Modulart**
je nach Studiengang Pflicht oder Wahlpflicht

**Lern-/Lehrform / Type of program**

**Vorkenntnisse / Previous knowledge**

<table>
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<th>Type of examination</th>
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**Course type**

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**Total time of attendance for the module**
56 h
neu141 - Visual Neuroscience - Physiology and Anatomy

Module label: Visual Neuroscience - Physiology and Anatomy
Module code: neu141
Credit points: 12.0 KP
Workload: 360 h

Used in course of study:
- Master Biologie > Background Modules
- Master Neuroscience > Background Modules

Contact person:
Module responsibility:
- Martin Greschner

Authorized examiners:
- Martin Greschner
- Karin Dedek
- Ulrike Janssen-Bienhold
- Christian Puller

Entry requirements

Skills to be acquired in this module

Module contents

Reader's advisory

Links

Language of instruction: English
Duration (semesters): 1 Semester

Module frequency

Module capacity: 12 - with Visual Neuroscience: Anatomy

Modullevel: ---

Modulart: je nach Studiengang Pflicht oder Wahlpflicht

Lern-/Lehrform / Type of program

Vorkenntnisse / Previous knowledge

Examination

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<td>SuSe or WiSe</td>
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Total time of attendance for the module: 84 h
### neu150 - Neuroanatomy

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| Used in course of study | Master Biologie > Background Modules  
                          | Master Neuroscience > Background Modules |
| Contact person          | Ulrike Janssen-Bienhold  
                          | Authorized examiners  
                          | Alle hier genannten  
                          | Module counceling  
                          | Karin Dedek |
| Entry requirements      | attendance in pre-meeting |
| Skills to be acquired in this module | Neurosci. knowlg. Expt. methods Independent research + Scient. literature + Social skills  
                              | Interdiscipl. knowlg. Maths/Stats/Progr. + Data present./disc. + Scientific English Ethics  
                              | Theory: Improved theoretical and methodological knowledge in neurobiology. Discussion of scientific work and presentation of own results.  
                              | Practice: Performing neuroanatomical experiments. Gaining modern methodological skills. |
| Module contents         | Lecture: 14 h Introduction to current neurobiological approaches and results.  
                          | Seminar: 14 h Discussion of background literature and results of own experiments.  
                          | Lab course: 3 weeks, each 24 h neuroanatomical experiments in small groups on vertebrate retina and brain. |
| Reader's advisory       | Background and seminar literature will be available in Stud.IP |
| Links                   | Language of instruction: English |
| Duration (semesters)    | 1 Semester |
| Module frequency        | jährlich |
| Module capacity         | unlimited |
| Reference text          | Course in the first half of the semester  
                          | Regular active participation and presentation(s) within the scope of the seminar are required to pass the module |
| Modullevel              | MM (Mastermodul) |
| Modularart              | Wahlpflicht |
| Vorkenntnisse / Previous knowledge | |

<table>
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<tr>
<th>Examination</th>
<th>Time of examination</th>
<th>Type of examination</th>
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<td>summer semester, first half</td>
<td>Portfolio (75 %), report (25%)</td>
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<td>SuSe</td>
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<tr>
<td>Seminar</td>
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<td>SuSe</td>
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<td>Practical</td>
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**Total time of attendance for the module**: 70 h
**neu290 - Biophysics of Sensory Reception**

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<tr>
<td>Module code</td>
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<td>Workload</td>
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| Used in course of study    | Master Biologie > Background Modules  
                            | Master Neuroscience > Background Modules |
| Contact person             | Michael Winklhofer              |

**Entry requirements**

**Skills to be acquired in this module**

**Module contents**

**Reader's advisory**

**Links**

**Language of instruction** English

**Duration (semesters)** 1 Semester

**Module frequency**

**Module capacity** 20

**Modullevel** ---

**Modular** je nach Studiengang Pflicht oder Wahlpflicht

**Lern-/Lehrform / Type of program**

**Vorkenntnisse / Previous knowledge**

**Examination**

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**Final exam of module**

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<th>Frequency</th>
<th>Workload attendance</th>
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<tr>
<td>Lecture</td>
<td></td>
<td>2.00</td>
<td>SuSe</td>
<td>28 h</td>
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<td>Seminar</td>
<td></td>
<td>2.00</td>
<td>SuSe</td>
<td>28 h</td>
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**Total time of attendance for the module** 56 h
neu360 - Auditory Neuroscience

Module label: Auditory Neuroscience
Module code: neu360
Credit points: 6.0 KP
Workload: 180 h

Used in course of study:
- Master Biologie > Background Modules
- Master Neuroscience > Background Modules

Contact person:
- Module responsibility: Christine Köppl
- Authorized examiners:
  - Georg Martin Klump
  - Christine Köppl

Entry requirements:

Skills to be acquired in this module:

Module contents:

Reader's advisory:

Links:

Language of instruction: English

Duration (semesters): 1 Semester

Module frequency:

Module capacity: 15

Modulart: je nach Studiengang Pflicht oder Wahlpflicht

Lern-/Lehrform / Type of program:

Vorkenntnisse / Previous knowledge:

Examination | Time of examination | Type of examination
--- | --- | ---

Final exam of module | HA

Course type | Comment | SWS | Frequency | Workload attendance
--- | --- | --- | --- | ---
Lecture | 2.00 | SuSe | 28 h
Seminar | 2.00 | SuSe | 28 h
Exercises | 2.00 | SuSe | 28 h

Total time of attendance for the module: 84 h
neu340 - Invertebrate Neuroscience

<table>
<thead>
<tr>
<th>Module label</th>
<th>Invertebrate Neuroscience</th>
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</thead>
<tbody>
<tr>
<td>Module code</td>
<td>neu340</td>
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<tr>
<td>Credit points</td>
<td>6.0 KP</td>
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<tr>
<td>Workload</td>
<td>180 h</td>
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<tr>
<td></td>
<td>(1 SWS Seminar (SE) Total workload 45h: 15h contact / 30h background literature reading, preparation for short tests and results presentation 3 SWS Supervised exercise (UE) Total workload 135h: 70h contact / 65h data analysis and preparation of portfolio assignments)</td>
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<tr>
<td>Used in course of study</td>
<td>Master Biologie &gt; Background Modules</td>
</tr>
<tr>
<td></td>
<td>Master Neuroscience &gt; Background Modules</td>
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<tr>
<td>Contact person</td>
<td>Module responsibility</td>
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<tr>
<td></td>
<td>Jutta Kretzberg</td>
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<tr>
<td>Entry requirements</td>
<td>attendance in pre-meeting</td>
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<td>Skills to be acquired in this module</td>
<td>++ Neurosci. knowlg.</td>
</tr>
<tr>
<td></td>
<td>++ Expt. Methods</td>
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<td>Scient. Literature</td>
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<tr>
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<td>Social skills</td>
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<td>Maths/Stats/Progr.</td>
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<td>Data present./disc.</td>
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<td>Scientific English</td>
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<td></td>
<td>Ethics</td>
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</table>

Upon successful completion of this course, students
• have knowledge on invertebrate neuronal systems in comparison to vertebrate systems
• have discussed an overview of experimental and theoretical methods of invertebrate neuroscience
• have acquired first practical skills in intracellular recordings from invertebrate neurons
• have acquired basic skills in data analysis
• have acquired an intuitive understanding of membrane potential and action potential generation based on computer simulations

Module contents
The background module Neurophysiology consists of three weeks of seminar and hands-on lab exercises on intracellular recordings from leech neurons, as well as computer simulations to study the basis of membrane potential and action potential generation. The seminar covers the following topics:
• Invertebrate neuronal systems in comparison to vertebrate systems
• Ion channels, membrane potential and action potential generation
• Introduction to electrophysiological methods
• Introduction to data analysis methods
In the practical exercises, portfolio assignments will be performed on:
• Qualitative electrophysiological classification of different cell types in the leech nervous system
• Quantitative analysis (stimulus - response relationship) of at least one cell type
• Action potential generation: Comparison of model simulations and experiments

Reader's advisory
Course scripts and mandatory scientific literature (3 review articles) discussed in the seminar will be available in Stud.IP
Background and seminar literature will be available in Stud.IP

Links
Language of instruction
English
Duration (semesters)
1 Semester
Module frequency
annually, summer term, second half
Module capacity
12 (this module provides the background for neu345 "Neural Computation in invertebrate systems")
Modulelevel
---
Moduleart
je nach Studiengang Pflicht oder Wahlpflicht

Lern-Lehrform / Type of program
Vorkenntnisse / Previous knowledge
basic knowledge of neurobiology, basic MATLAB programming skills

Examination
Time of examination
Final exam of module
during the course (summer term, second half)
Portfolio consisting of short tests and short reports
In addition, mandatory but ungraded: seminar presentation

Course type
Comment
SWS
Frequency
Workload attendance
Seminar
2.00
SuSe or WiSe
28 h
Exercises
2.00
SuSe or WiSe
28 h
<table>
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<th>Frequency</th>
<th>Workload attendance</th>
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<td></td>
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<td>56 h</td>
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neu300 - Functional MRI data analysis

Module label  Functional MRI data analysis
Module code  neu300
Credit points  12.0 KP
Workload  360 h
Used in course of study  
  • Master Biologie > Background Modules  
  • Master Neuroscience > Background Modules

Contact person

  Module responsibility  
  • Carsten Gießing

  Authorized examiners  
  • Carsten Gießing  
  • Christiane Margarete Thiel

Entry requirements

Skills to be acquired in this module

Module contents

Reader's advisory

Links

Language of instruction  English
Duration (semesters)  1 Semester

Module frequency

Module capacity  12 (in total with bio640)

Modulart  je nach Studiengang Pflicht oder Wahlpflicht

Lern-/Lehrform / Type of program

Vorkenntnisse / Previous knowledge

Examination Time of examination Type of examination

Final exam of module

<table>
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Total time of attendance for the module  112 h
# neu310 - Psychophysics of Hearing

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<tbody>
<tr>
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<tr>
<td>Master Neuroscience &gt; Background Modules</td>
<td></td>
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</table>

**Contact person**

- Module responsibility
  - Georg Martin Klump
- Authorized examiners
  - Georg Martin Klump
  - Ulrike Langemann

**Entry requirements**

**Skills to be acquired in this module**

**Module contents**

**Reader's advisory**

**Language of instruction**

- English

**Duration (semesters)**

- 1 Semester

**Module frequency**

**Module capacity**

- 6 (in total with bio640)

**Modulart**

- je nach Studiengang Pflicht oder Wahlpflicht

**Lern-/Lehrform / Type of program**

**Vorkenntnisse / Previous knowledge**

**Examination**

<table>
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<tr>
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<td>Seminar</td>
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<td>Lecture</td>
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**Time of examination**

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<th>SWS</th>
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<th>Workload attendance</th>
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<td>14 h</td>
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<tr>
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<td>2.00</td>
<td>SuSe</td>
<td>28 h</td>
</tr>
<tr>
<td>Practical</td>
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<td>SuSe</td>
<td>70 h</td>
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<tr>
<td>Lecture</td>
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<td>SuSe</td>
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**Total time of attendance for the module**

- 112 h
# Research Modules

## bio900 - Biology Research Module

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<tr>
<td>Workload</td>
<td>450 h</td>
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<tr>
<td>Used in course of study</td>
<td>Master Biologie &gt; Research Modules</td>
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</table>

### Contact person

- Module responsibility
  - Gerhard Wolfgang Zotz
- Authorized examiners
  - Gerhard Wolfgang Zotz
  - Lehrende der Biologie
- Module counseling
  - Lehrende der Biologie

### Entry requirements

**Skills to be acquired in this module**

- Students will learn to plan, perform and analyse a study in a biological field. Topics will be chosen in close coordination with teaching staff. Depending on the particular project, knowledge in statistics, molecular biology, physiology, modelling, or ethology will be necessary. Results will be related to the current biological literature in a written report and be presented in the seminar of the hosting working group.
  
  - **deepened knowledge of biological working methods**
  - **data analysis skills**
  - **critical and analytical thinking**
  - **independent searching and knowledge of scientific literature**
  - **ability to perform independent biological research**
  - **data presentation and discussion in German and English (written and spoken)**
  - **teamwork**
  - **project and time management**
  - **statistics & scientific programming**

### Module contents

The students develop an empirical investigation, carry it out and analyse the results. The students present and discuss their project both orally and in writing.

### Reader's advisory

- German, English

### Links

- Duration (semesters): 1 Semester

### Module frequency

- Module capacity: unlimited

### Reference text

Within the Modul bio900 is it possible to take several courses as long as their contents differ substantially. When taking the course group 5.02.960 it is mandatory to choose two courses out of the group A – D.

### Modullevel

- MM (Mastermodul / Master module)

### Modulart

- Wahlpflicht / Elective

### Lern-Lehrform / Type of program

### Vorkenntnisse / Previous knowledge

### Examination

<table>
<thead>
<tr>
<th>Time of examination</th>
<th>Type of examination</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>intership report</td>
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### Final exam of module

- Projektorientiertes Modul

### Course type

- SWS: 10.00

### Frequency

- SuSe and WiSe

### Workload attendance

- 140 h
bio810 - Independent Research

<table>
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<td>Workload</td>
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<tr>
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<td>Master Biologie &gt; Research Modules</td>
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**Contact person**
- Module responsibility
  - Gerhard Wolfgang Zotz
- Authorized examiners
  - Gerhard Wolfgang Zotz

**Entry requirements**

++ deepened biological expertise  
++ deepened knowledge of biological working methods  
++ data analysis skills  
++ critical and analytical thinking  
++ independent searching and knowledge of scientific literature  
++ ability to perform independent biological research  
++ data presentation and discussion in German and English (written and spoken)  
+ teamwork  
++ project and time management  
++ statistics & scientific programming

Most modules in the MSc Biologie at Oldenburg are still rather rigorously structured course work and lectures and provide relatively little opportunity for independent research. Some students do not want to wait until starting their master thesis to get first-hand experience in actual research in their field of interest. This module opens the possibility to students to practice both geographical flexibility and gain important experience by active participation in on-going research in a working group from Oldenburg or any other place before starting their master thesis. "Learning on the job" is the basic motto.

**Module contents**
The content and venue of this module is chosen in close coordination with the Prüfungsausschuss Master Biologie, possibly with consultations of other professors. The 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 (University Oldenburg, other national or international 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.

**Reader’s advisory**
vary with chosen topic

**Language of instruction**
- English

**Duration (semesters)**
- 1 Semester

**Module frequency**
- halbjährlich

**Module capacity**
- unlimited

**Module level**
- MM (Mastermodul / Master module)

**Module type**
- Wahlpflicht / Elective

**Lern-/Lehrform / Type of program**

**Vorkenntnisse / Previous knowledge**

**Examination**

<table>
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<tr>
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**Final exam of module**

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<th>SWS</th>
<th>Frequency</th>
<th>Workload attendance</th>
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</thead>
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<tr>
<td>Seminar</td>
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<td>SuSe and WiSe</td>
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<tr>
<td>Projektorientiertes Modul</td>
<td>10.00</td>
<td>SuSe and WiSe</td>
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**Total time of attendance for the module**
- 154 h
bio820 - Research Module Fast Track

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<td>Master Biologie &gt; Research Modules</td>
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</table>

Contact person

Module responsibility

- Georg Martin Klump

Authorized examiners

- Georg Martin Klump

Entry requirements

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 in German and English (written and spoken)
++ teamwork
++ project and time management
++ statistics & scientific programming

Module contents

Reader's advisory

Links

Languages of instruction

German, English

Duration (semesters)

1 Semester

Module frequency

unregelmäßig

Module capacity

unlimited

Modullevel

---

Modulart

je nach Studiengang Pflicht oder Wahlpflicht

Lern-/Lehrform / Type of program

Vorkenntnisse / Previous knowledge

Examination Time of examination Type of examination

Final exam of module written report

Course type

Seminar

SWS

0.00

Frequency

--

Workload attendance

0 h
**Skills Modules**

**bio870 - Communicating Plant Sciences**

<table>
<thead>
<tr>
<th>Module label</th>
<th>Communicating Plant Sciences</th>
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<tbody>
<tr>
<td>Module code</td>
<td>bio870</td>
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<td>Workload</td>
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<tr>
<td>Used in course of study</td>
<td>Master Biologie &gt; Skills Modules</td>
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**Contact person**

- Module responsibility
  - Gerhard Wolfgang Zotz
- Authorized examiners
  - Gerhard Wolfgang Zotz
  - Sascha Laubinger
  - Dirk Carl Albach
- Module counselling
  - Sascha Laubinger
  - Dirk Carl Albach

**Entry requirements**

- Communicating and practicing scientific presentation techniques (talk, publication, poster)
- Presentation of data and discussion in spoken and written (English)
- Communicating of techniques in problem treatment in free speech and scientific writing
- Independent investigation and knowledge of scientific primary literature
- + interdisciplinary thinking
- ++ critical and analytical thinking
- +++ independent searching and knowledge of scientific literature
- +++ data presentation and discussion in German and English (written and spoken)

**Module contents**

- S: Working group seminar (2 SWS; Choice 1: Functional Ecology; Choice 2: Evolutionary genetics of plants; Choice 3: Plant biodiversity and evolution)
- S: Scientific Writing in Plant Science (2 SWS)

**Reader's advisory**

- Languages of instruction: German, English
- Duration (semesters): 1 Semester
- Module frequency: 12
- Module capacity: 12
- Module level: MM (Mastermodul / Master module)
- Module type: Wahlmodul / Opportunity
- Lern-/Lehrform / Type of program
- Vorkenntnisse / Previous knowledge: Ecology, Flora, Genetics

**Examination**

<table>
<thead>
<tr>
<th>Final exam of module</th>
<th>Type of examination</th>
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</thead>
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<td>1 presentation (25%)</td>
<td>1 report (75%)</td>
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**Course type**

- Seminar

**SWS**

- 4.00

**Frequency**

- WiSe

**Workload attendance**

- 56 h
**bio880 - Skills in Plant Systematics**

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<tbody>
<tr>
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<tr>
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<td>6.0 KP</td>
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<tr>
<td>Workload</td>
<td>180 h</td>
</tr>
<tr>
<td>Used in course of study</td>
<td>• Master Biologie &gt; Skills Modules</td>
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**Contact person**

- Module responsibility
  - Dirk Carl Albach

- Authorized examiners
  - Dirk Carl Albach
  - Klaus Bernhard von Hagen
  - Thijs Janzen

**Module counseling**

- Klaus Bernhard von Hagen

**Entry requirements**

**Skills to be acquired in this module**

- In this module, we provide the skills necessary to describe and distinguish species for floras and monographs/first publication of species. For that, an overview over the plant kingdom is provided. Further, various non-molecular methods of systematics are practiced, such as morphometry, SEM, identification key generation, nomenclature, species delimitation methods, and interpretation of phylogenetic analyses.

  - + deepened biological expertise
  - ++ deepened knowledge of biological working methods
  - ++ data analysis skills
  - + critical and analytical thinking
  - ++ independent searching and knowledge of scientific literature
  - + ability to perform independent biological research
  - ++ data presentation and discussion in German and English (written and spoken)
  - + teamwork
  - + statistics & scientific programming

**Module contents**

- In the seminar we provide an overview over the larger groups of plants and characters for their grouping. We analyse methods for phylogeny generation, angiosperm classification and description of new taxa.

  - In the exercises morphological characters are investigated in various ways and internet resources for further morphological characters presented. Species delimitation methods for molecular and morphological characters are used. Identification keys are generated and nomenclatural rules discussed.

**Reader’s advisory**

**Links**

- Languages of instruction: German, English

**Duration (semesters)**

- 1 Semester

**Module frequency**

- Module capacity: 8

**Module level**

- WSH (Mastermodul / Master module)

**Module type**

- Wahlmodul / Opportunity

**Vorkenntnisse / Previous knowledge**

- good knowledge of local flora

**Examination**

<table>
<thead>
<tr>
<th>Type of examination</th>
<th>Time of examination</th>
<th>WSH</th>
<th>Frequency</th>
<th>Workload attendance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seminar</td>
<td>2.00</td>
<td>WiSe</td>
<td>28 h</td>
<td></td>
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<tr>
<td>Exercises</td>
<td>2.00</td>
<td>WiSe</td>
<td>28 h</td>
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</tr>
</tbody>
</table>

**Total time of attendance for the module**

- 56 h
bio890 - Current Topics in Biology

Module label: Current Topics in Biology
Module code: bio890
Credit points: 3.0 KP
Workload: 90 h

Used in course of study: Master Biologie > Skills Modules

Contact person:
- Module responsibility
  - Gabriele Gerlach
- Authorized examiners
  - Olaf Bininda-Emonds
- Module counseling
  - Lehrende der Biologie

Entry requirements

Skills to be acquired in this module:
+ biological knowledge
+ biologically relevant, natural / mathematical scientific basic knowledge
++ interdisciplinary knowledge and thinking
++ abstract, logical, and analytical thinking
++ expanded knowledge in a specific biological field
++ presentation of results and factual discussion, both written and spoken
++ (scientific) communication skills

To develop skills in the critical analysis and interpretation of results and themes in diverse areas of modern biology, including (but not limited to) evolutionary biology, population genetics, biodiversity, ecology, genomics, ornithology, and neurobiology.

Module contents:
Discussion and interpretations of one or more themes in modern biology. The themes and exact content will be provided by the instructor(s) at the beginning of the course.

Reader's advisory:
Varies with chosen topic (will be provided by the instructor(s) at the beginning of the course)

Links:
Languages of instruction: English, German
Duration (semesters): 1 Semester

Module frequency
Module capacity: unlimited
Module level: MM (Mastermodul / Master module)
Module art: Wahlmodul / Opportunity

Lern-/Lehrform / Type of program

Vorkenntnisse / Previous knowledge: Attendance in one or more introductory modules in Master Biology.

Examination
- Time of examination
- Type of examination
- Final exam of module: open
- Portfolio
- Course type: Seminar

SWS: 2.00
Frequency: SuSe and WiSe
Workload attendance: 28 h
**neu770 - Basics of Statistical Data Analysis**

**Module label**  
Basics of Statistical Data Analysis

**Module code**  
neu770

**Credit points**  
6.0 KP

**Workload**  
180 h  
(1.5 SWS Lecture (VO) Total workload 68h: 28h contact / 20h background reading / 20h exam preparation 2.5 SWS Seminar (SE) Total workload 113h: 28h contact / 20h background reading / 65h exercise solving)

**Used in course of study**  
- Fach-Bachelor Physik, Technik und Medizin > Aufbaumodule  
- Master Biologie > Skills Modules  
- Master Neuroscience > Skills Modules

**Contact person**  
Module responsibility  
- Fabian Otto-Sobotka

**Authorized examiners**  
- Fabian Otto-Sobotka

**Entry requirements**

**Skills to be acquired in this module**  
+ Social skills  
+ Interdiscipl. knowl.  
++ Maths/Stats/Progr.  
+ Scientific English

Upon successful completion of this course, students  
have basic statistical competencies for understanding data  
understand the main statistical methods and their practical use through application  
can evaluate statistical methods regarding the qualities and their limits

**Module contents**

- populations and samples; exploratory data analysis through describing statistics  
- elementary probabilities and random variables  
- important discrete and continuous distributions  
- estimating parameters through the method of maximum likelihood  
- confidence intervals and classical significance testing  
- pairs of random variables; distribution and dependence  
- classical regression analysis  
- basic use of the software R to apply those methods

**Reader's advisory**  
Will be available in Stud.IP

**Links**

**Language of instruction**  
English

**Duration (semesters)**  
1 Semester

**Module frequency**  
annually, winter term

**Module capacity**  
unlimited

**Modulart**  
je nach Studiengang Pflicht oder Wahlpflicht

**Lern-/Lehrform / Type of program**

**Vorkenntnisse / Previous knowledge**  
basic mathematical knowledge; une of probabilities recommended in combination with neu720 Statistical programming with R

**Examination**  
Time of examination  
Type of examination  

<table>
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<th>Time of examination</th>
<th>Type of examination</th>
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<td>written exam, 2h</td>
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**Course type**  
**Comment**  
**SWS**  
**Frequency**  
**Workload attendance**

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<th>SWS</th>
<th>Frequency</th>
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<tr>
<td>Lecture</td>
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<td>28 h</td>
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<tr>
<td>Seminar</td>
<td></td>
<td>2.00</td>
<td></td>
<td>28 h</td>
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</table>

**Total time of attendance for the module**  
56 h
neu720 - Statistical programming in R

Module label: Statistical programming in R
Module code: neu720
Credit points: 6.0 KP
Workload: 180 h
- 1.5 SWS Lecture (VO) Total workload 68h: 28h contact / 20h background reading / 20h exam preparation
- 2.5 SWS Supervised exercise (UE): Total workload 113h: 28h contact / 20h background reading / 65h exercise solving

Used in course of study:
- Master Biologie > Skills Modules
- Master Neuroscience > Skills Modules

Contact person:
Module responsibility
- Fabian Otto-Sobotka

Authorized examiners
- Fabian Otto-Sobotka

Entry requirements:

Skills to be acquired in this module:
- Social skills
- Interdiscipl. knowlg.
- Maths/Stats/Progr.
- Scientific English

- students learn the use of the software R in application scenarios
- students learn to actively "speak" the programming language R
- students practice statistical data analysis with R

Module contents:
The lecture gives an intuitive introduction into the use of the statistics software R. We start by introducing the basic handling of R and the syntax of its programming language. We use those to obtain the first statistical analyses from R. The next important step is to create informative graphics to represent the statistical results. Finally, we look into programming concepts that allow for more complex statistical analyses.

Reader's advisory:
R Core Team - R: A language and environment for statistical computing (Reference Manual)

Links:

Language of instruction: English
Duration (semesters): 1 Semester
Module frequency: annually, summer term
Module capacity: 24
Reference text:
- Recommended previous knowledge / skills: basic statistical knowledge including regression analysis

Modullevel: ---
Modulart: je nach Studiengang Pflicht oder Wahlpflicht

Lern-Lehrform / Type of program:

Vorkenntnisse / Previous knowledge: basic statistical knowledge including regression analysis

Examination:
- Time of examination: after the course
- Type of examination: practical exercise

Final exam of module:
- Course type: Lecture, Exercises
- Comment: 2.00
- SWS: 2.00
- Frequency: SuSe
- Workload attendance: 28 h

Total time of attendance for the module: 56 h
neu730 - Biosciences in the Public Eye and in our Laws

Module label: Biosciences in the Public Eye and in our Laws
Module code: neu730
Credit points: 6.0 KP
Workload: 180 h
- (3.5 SWS Supervised exercise (UE) Total workload 158h: 48h contact / 40h preparation of presentation / 70h term paper 0.5 SWS Lecture (VO) Total workload 23h: 10h contact / 13 h background research)

Used in course of study:

- Fach-Bachelor Betriebswirtschaftslehre für Leistungssportlerinnen und Leistungssportler > Fachnahe Angebote Biologie
- Fach-Bachelor Betriebswirtschaftslehre mit juristischem Schwerpunkt > Fachnahe Angebote Biologie
- Fach-Bachelor Biologie > Fachnahe Angebote Biologie
- Fach-Bachelor Business Administration in mittelständischen Unternehmen > Fachnahe Angebote Biologie
- Fach-Bachelor Chemie > Fachnahe Angebote Biologie
- Fach-Bachelor Comparative and European Law > Fachnahe Angebote Biologie
- Fach-Bachelor Engineering Physics > Fachnahe Angebote Biologie
- Fach-Bachelor Informatik > Fachnahe Angebote Biologie
- Fach-Bachelor Interkulturelle Bildung und Beratung > Fachnahe Angebote Biologie
- Fach-Bachelor Mathematik > Fachnahe Angebote Biologie
- Fach-Bachelor Nachhaltigkeitsökonomik > Fachnahe Angebote Biologie
- Fach-Bachelor Pädagogik > Fachnahe Angebote Biologie
- Fach-Bachelor Pädagogisches Handeln in der Migrationsgesellschaft > Fachnahe Angebote Biologie
- Fach-Bachelor Physik > Fachnahe Angebote Biologie
- Fach-Bachelor Physik, Technik und Medizin > Fachnahe Angebote Biologie
- Fach-Bachelor Sozialwissenschaften > Fachnahe Angebote Biologie
- Fach-Bachelor Umweltwissenschaften > Fachnahe Angebote Biologie
- Fach-Bachelor Wirtschaftsinformatik > Fachnahe Angebote Biologie
- Fach-Bachelor Wirtschaftswissenschaften > Fachnahe Angebote Biologie
- Master Biologie > Skills Modules
- Master Neuroscience > Skills Modules
- Zwei-Fächer-Bachelor Anglistik > Fachnahe Angebote Biologie
- Zwei-Fächer-Bachelor Biologie > Fachnahe Angebote Biologie
- Zwei-Fächer-Bachelor Chemie > Fachnahe Angebote Biologie
- Zwei-Fächer-Bachelor Elementarmathematik > Fachnahe Angebote Biologie
- Zwei-Fächer-Bachelor Ev. Theologie und Religionspädagogik > Fachnahe Angebote Biologie
- Zwei-Fächer-Bachelor Gender Studies > Fachnahe Angebote Biologie
- Zwei-Fächer-Bachelor Interdisziplinäre Fachausbildung > Fachnahe Angebote Biologie
- Zwei-Fächer-Bachelor Kunst und Medien > Fachnahe Angebote Biologie
- Zwei-Fächer-Bachelor Materielle Kultur: Textil > Fachnahe Angebote Biologie
- Zwei-Fächer-Bachelor Mathematik > Fachnahe Angebote Biologie
- Zwei-Fächer-Bachelor Musik > Fachnahe Angebote Biologie
- Zwei-Fächer-Bachelor Niederlandistik > Fachnahe Angebote Biologie
- Zwei-Fächer-Bachelor Ökonomische Bildung > Fachnahe Angebote Biologie
- Zwei-Fächer-Bachelor Pädagogik > Fachnahe Angebote Biologie
- Zwei-Fächer-Bachelor Philosophie / Werte u. Normen > Fachnahe Angebote Biologie
- Zwei-Fächer-Bachelor Politik-Wirtschaft > Fachnahe Angebote Biologie
- Zwei-Fächer-Bachelor Slavistik > Fachnahe Angebote Biologie
- Zwei-Fächer-Bachelor Sonderpädagogik > Fachnahe Angebote Biologie
- Zwei-Fächer-Bachelor Sozialwissenschaften > Fachnahe Angebote Biologie
- Zwei-Fächer-Bachelor Sportwissenschaft > Fachnahe Angebote Biologie
- Zwei-Fächer-Bachelor Technik > Fachnahe Angebote Biologie
- Zwei-Fächer-Bachelor Wirtschaftswissenschaften > Fachnahe Angebote Biologie

Contact person:
- Module responsibility
  - Christine Köppl
  - Authorized examiners
  - Alle hier genannten
  - Module counseling
  - Ulrike Sienknecht

Entry requirements:

Skills to be acquired in this module:
+ Scient. Literature
++ Social skills
++ Data present./disc.

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Upon completion of this course, students will:

- have basic knowledge of non-biological aspects of professional life (e.g., law, management, languages)
- know the basic safety and environmental concerns in bioscientific workplaces
- be able to critically define and discuss ethical conflicts in biological research, e.g., in the context of stem cell research or data manipulation
- have the ability to communicate scientific concepts, both orally and in writing
- be able to prepare and give a coherent presentation in a team
- have practised to lead a group discussion

Module contents

Lectures introduce the legal framework and the application procedures for experimental work with animals, humans and genetically modified organisms. In supervised exercises, students research the ethical aspects and controversial issues of about 10 particular topics in the biosciences. They take turns in summarizing and presenting each topic in small teams, and leading a critical discussion of each topic. Problem-based, independent research of the scientific background by the students is an integral part of this module.

Example topics:
- Good scientific practise and fraud
- Neuroenhancement
- Artificial intelligence
- Animal welfare, Animal experiments
- Overfishing, Nature conservation
- State-of-the-art genetic tools and their implications
- Genetically modified organisms, e.g., in food production, chimeras
- Stem cells
- Humans as experimental subjects

A bonus can be obtained through active participation during the semester. Active participation requires regular oral contributions to the group discussions, that go beyond giving your own talks. A bonus improves the exam mark by one step (0.3 or 0.4). The bonus is optional, an exam mark of 1.0 is achievable without a bonus. A bonus cannot be applied to pass a failed exam.

Reader's advisory

Current law and interpretative commentaries, e.g., by the German Research Council (DFG) or the German Ethics Panel
Introductory papers aimed at lay persons, e.g. from “The Scientist” or widely respected newspapers
Problem-based, independent search for relevant scientific literature is an integral part of this module

Links

Languages of instruction: German, English
Duration (semesters): 1 Semester
Module frequency: annually, summer term
Module capacity: 18
Modullevel: ---
Modulart: je nach Studiengang Pflicht oder Wahlpflicht
Lern-Lehrform / Type of program
Vorkenntnisse / Previous knowledge: Fundamentals of genetics, physiology, ecology and biological systematics
Examination:
- Time of examination: within a few weeks of summer term lecture period
- Type of examination: Term paper
  - In addition, mandatory but ungraded: Regular participation during the semester is required (max 3 days of absence)

Course type
- Lecture: 2.00 SWS, SuSe, 28 h
- Seminar und Übung: 2.00 SWS, SuSe, 28 h

Total time of attendance for the module: 56 h
neu740 - Molecular Mechanisms of Ageing

Module label: Molecular Mechanisms of Ageing
Module code: neu740
Credit points: 6.0 KP
Workload: 180 h
(4 SWS Supervised exercise (UE) Total workload 180h: 26h contact / 50h group work / 50h prep. of thesis, presentations / 54h recap. literature)

Used in course of study

- Fach-Bachelor Betriebswirtschaftslehre für Leistungssportlerinnen und Leistungssportler > Fachnahe Angebote Biologie
- Fach-Bachelor Betriebswirtschaftslehre mit juristischem Schwerpunkt > Fachnahe Angebote Biologie
- Fach-Bachelor Biologie > Fachnahe Angebote Biologie
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- Fach-Bachelor Pädagogik > Fachnahe Angebote Biologie
- Fach-Bachelor Pädagogisches Handeln in der Migrationsgesellschaft > Fachnahe Angebote Biologie
- Fach-Bachelor Physik > Fachnahe Angebote Biologie
- Fach-Bachelor Physik, Technik und Medizin > Fachnahe Angebote Biologie
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- Fach-Bachelor Umweltwissenschaften > Fachnahe Angebote Biologie
- Fach-Bachelor Wirtschaftswissenschaften > Fachnahe Angebote Biologie
- Master Biologie > Skills Modules
- Master Neuroscience > Skills Modules
- Zwei-Fächer-Bachelor Anglistik > Fachnahe Angebote Biologie
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- Zwei-Fächer-Bachelor Gender Studies > Fachnahe Angebote Biologie
- Zwei-Fächer-Bachelor Germanistik > Fachnahe Angebote Biologie
- Zwei-Fächer-Bachelor Geschichte > Fachnahe Angebote Biologie
- Zwei-Fächer-Bachelor Informatik > Fachnahe Angebote Biologie
- Zwei-Fächer-Bachelor Interdisziplinäre Sachbildung > Fachnahe Angebote Biologie
- Zwei-Fächer-Bachelor Kunst und Medien > Fachnahe Angebote Biologie
- Zwei-Fächer-Bachelor Materielle Kultur: Textil > Fachnahe Angebote Biologie
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- Zwei-Fächer-Bachelor Technik > Fachnahe Angebote Biologie
- Zwei-Fächer-Bachelor Wirtschaftswissenschaften > Fachnahe Angebote Biologie

Contact person

- Module responsibility
  - Kathrin Thedieck
- Authorized examiners
  - Kathrin Thedieck

Entry requirements

Skills to be acquired in this module:

- Neurosci. knowlg.
- Exp. methods
- Scient. literature
- Social skills
- Interdiscipl. knowlg.
- Data present./disc.
In this module the participants gain an overview of arguments and experimental strategies in ageing research. We will focus on the fields of medicine/epidemiology, biochemistry/cell biology, physiology, and genetics. In addition, the main ageing theories will be covered. The participants work throughout the semester in project groups and present their results at a conference at the end of the course. Ethicists and philosophers from Germany and The Netherlands accompany the course, and chair at the conference a session on ethical aspects of ageing research. Under their moderation, the participants derive joint standpoints and policy recommendations. At the end of this course the participants can understand, analyse, and present scientific articles from ageing research present the results of their studies and analyses using different presentation techniques apply the learned contents in novel contexts (ethics in ageing research)

Topics

Major ageing theories

arguments and experimental strategies in the fields of medicine/epidemiology, biochemistry/cell biology, physiology, genetics in ageing research application of the learned contents in novel contexts (ethics in ageing research) understanding, analysing, and presentation of scientific articles

Module contents

Lecture: major ageing theories and methods in ageing research are presented and discussed Exercise: project work
1) Students: Choice of research focus
2) Independent work on the chosen research paper
3) Writing a 1 page thesis paper
4) Presentation in own expert group
5) Expert groups: research strategies, approaches, methods in chosen focus area
6) Development of a group presentation and group poster
7) Presentation at 1 day conference
8) Dutch and German ethics experts present bioethics and lobby work in German and Dutch political gremia
9) The students develop a comparative view on medical ethics in different countries and derive own standpoints and policy recommendations for the ethical assessment of metabolic and ageing research. The project work runs independently in the different expert groups throughout the semester and is organised via StudIP. The students and groups receive regular feedback and guidance in presence meetings.

The days for presence meetings and final conference are determined with the participants during the first meeting. The students organize their own work in groups according to the jigsaw concept. Their work is structured by a weekly schedule, tasks to be handed in at fixed deadlines across the semester, lectures and presence meetings.

Reader's advisory

Primary and secondary literature will be provided and introduced at the first meeting

Recommended textbook(s) or other literature:
Roger B. McDonald, Biology of aging, Garland Science
Ludger Rensing ; Volkhard Rippe

Links

Language of instruction English
Duration (semesters) 1 Semester
Module frequency annually, summer term
Module capacity 16
Modullevel ---
Modulart je nach Studiengang Pflicht oder Wahlpflicht
Lern-/Lehrform / Type of program

Vorkenntnisse / Previous knowledge

Examination Time of examination Type of examination
Final exam of module end of semester portfolio: thesis paper, oral presentation, poster presentation In addition, mandatory but ungraded:
<table>
<thead>
<tr>
<th>Examination</th>
<th>Time of examination</th>
<th>Type of examination</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>questionnaire on ageing theories, meeting protocols</td>
</tr>
<tr>
<td>Course type</td>
<td>Comment</td>
<td>SWS</td>
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<tr>
<td>Lecture</td>
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<td>SuSe</td>
</tr>
<tr>
<td>Exercises</td>
<td>4.00</td>
<td>SuSe</td>
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**Total time of attendance for the module** 84 h
# neu751 - Laboratory Animal Science

<table>
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<tr>
<th>Module label</th>
<th>Laboratory Animal Science</th>
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<tbody>
<tr>
<td>Module code</td>
<td>neu751</td>
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<tr>
<td>Credit points</td>
<td>3.0 KP</td>
</tr>
<tr>
<td>Workload</td>
<td>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)</td>
</tr>
</tbody>
</table>
| Used in course of study | • Master Biologie > Skills Modules  
• Master Neuroscience > Skills Modules |
| Contact person        | Module responsibility  
Christine Köppl |
| Authorized examiners  | Christine Köppl  
Georg Martin Klump  
Ulrike Langemann  
Arne Nolte |
| Entry requirements    | Skills to be acquired in this module  
++ Expt. Methods  
+ Independent research  
+ Scient. Literature  
++ Social skills  
++ Interdiscipl. knowlg.  
+ Scientific English  
++ Ethics  
Upon successful completion of this course, students  
• know the relevant EU legislation governing animal welfare and are able to explain its meaning in common language  
• understand and are able to critically discuss salient ethical concepts in animal experimentation, such as the three Rs and humane endpoint.  
• have basic knowledge of the biology and husbandry of laboratory animal species held at the University of Oldenburg (rodents or birds or fish)  
• are able to critically assess the needs and welfare of animals without compromising scientific integrity of the investigation  
• have practical skills in handling small rodents or birds or fish  
• have profound knowledge of anaesthesia, analgesia and basic principles of surgery.  
• have practised invasive procedures and euthanasia.  
NOTE: These objectives aim to satisfy the requirements for EU directive A „Persons carrying out animal experiments” and EU directive D „Persons killing animals”. We aim to obtain accreditation by the Federation of European Laboratory Animal Science Associations (FeLaSa) by 2018. |
| Module contents       | Background knowledge is taught using the third-party online platform “LAS Interactive” which concludes with a written exam that has to be passed before the practical part. Topics covered are: • Legislation, ethics and the 3Rs • Scientific integrity • Data collection • Basic biology of rodents, birds and fish • Husbandry, and nutrition of rodents, birds and fish • Animal Welfare • Health monitoring • Pain and distress • Euthanasia Practical procedures will first be demonstrated, important aspects will then be practiced under supervision by every 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 |
| Reader's advisory     | "LAS interactive" internet-based learning platform  
Wiley-Blackwell |
| Links                 | Language of instruction: English  
Duration (semesters): 1 Semester  
Module frequency: semester break, every semester  
Module capacity: 15 (Registration procedure / selection criteria: StudIP, sequence of registration)  
Modullevel: ---  
Modulart: je nach Studiengang Pflicht oder Wahlpflicht  
Lern-/Lehrform / Type of program:  
Vorkenntnisse / Previous knowledge: |
<table>
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<th>Type of examination</th>
</tr>
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<tbody>
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<td>immediately before the practical part</td>
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<th>Workload attendance</th>
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<tbody>
<tr>
<td>Lecture</td>
<td>1.00</td>
<td></td>
<td>SuSe and WiSe</td>
<td>14 h</td>
</tr>
<tr>
<td>Exercises</td>
<td>1.00</td>
<td></td>
<td>SuSe and WiSe</td>
<td>14 h</td>
</tr>
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</table>

**Total time of attendance for the module** 28 h
neu760 - Scientific English

Module label: Scientific English
Module code: neu760
Credit points: 6.0 KP
Workload: 180 h
- 0.5 SWS Lecture (VO) Total workload 23h: 8h contact / 15h research for term paper
- 3.5 SWS Supervised exercise (UE) Total workload 158h: 46h contact / 46h preparation of texts and presentations / 66h term paper

Used in course of study:
- Master Biologie > Skills Modules
- Master Neuroscience > Skills Modules

Contact person:
Module responsibility
- Jannis Hildebrandt

Authorized examiners
- Jannis Hildebrandt

Entry requirements:
- non-native speakers

Skills to be acquired in this module:
+ Neurosci. knowlg.
++ Social skills
++ Data present./disc.
++ Scientific English

Upon completion of this course, students have increased their proficiency in different forms of scientific presentation and communication in English, with special emphasis on neuroscience. They are able to express themselves with correct sentence structure and grammar, correct use of idioms and correct pronunciation. They are proficient in different contexts of scientific communication (e.g., paper, poster and informal exchange by email or phone). They are able to recognize and avoid common errors of non-native speakers.

Module contents:
Lectures cover
- characteristics of the different forms of scientific presentations
- sentence structure using the passive voice
- scientific vocabulary and terminology as contrasted to common speech
- appropriate language for communication with scientific editors and referees

Students read neuroscience texts of an advanced level and practice explaining and presenting these in both written and oral form. They also practice different contexts of scientific communication (e.g., paper, poster and informal exchange by email or phone). Emphasis is placed on individual problems in pronunciation and language use errors.

Reader's advisory:
http://users.wpi.edu/~nab/sci_eng/ScientificEnglish.pdf

Links:
Language of instruction: English
Duration (semesters): 1 Semester
Module frequency: annually, semester break
Module capacity: 12
Reference text:
Usually held in the break before summer term
Additional teachers in the module: outsourced to STELS-OL (Scientific and Technical English Language Service, Oldenburg); native English speaker with in-depth neuroscience knowledge

Modullevel: ---
Modulart: je nach Studiengang Pflicht oder Wahlpflicht

<table>
<thead>
<tr>
<th>Lern-/Lehrform / Type of program</th>
<th>Vorkenntnisse / Previous knowledge</th>
<th>English level B2 according to Common European Framework of Reference for Languages (CEFR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Examination / Time of examination</td>
<td>Type of examination</td>
<td>Final exam of module within 2 months of completing the course Portfolio: 50% presentation, 50% assignment; bonus for active participation</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Course type</th>
<th>Comment</th>
<th>SWS</th>
<th>Frequency</th>
<th>Workload attendance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecture</td>
<td></td>
<td>1.00</td>
<td>WiSe</td>
<td>14 h</td>
</tr>
<tr>
<td>Exercises</td>
<td></td>
<td>3.00</td>
<td>WiSe</td>
<td>42 h</td>
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Total time of attendance for the module: 56 h
neu780 - Introduction to Data Analysis with Python

<table>
<thead>
<tr>
<th>Module label</th>
<th>Introduction to Data Analysis with Python</th>
</tr>
</thead>
<tbody>
<tr>
<td>Module code</td>
<td>neu780</td>
</tr>
<tr>
<td>Credit points</td>
<td>6.0 KP</td>
</tr>
<tr>
<td>Workload</td>
<td>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)</td>
</tr>
</tbody>
</table>
| Used in course of study | • Master Biologie > Skills Modules  
• Master Neuroscience > Skills Modules |
| Contact person | Module responsibility  
Michael Winkhofer  
Authorized examiners  
Michael Winkhofer |
| Entry requirements | Skills to be acquired in this module  
+ Neurosci. knowlg.  
++ Maths/Stats/Progr.  
+ Data present./disc. |

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 [https://www.python.org/](https://www.python.org/).

Students will learn how to write effective scripts for data processing and visualisation, making use of pre-existing program libraries for various generic purposes (maths, statistics, plotting, image analysis).

Typical applications will be analysis of time series (e.g., electrophysiological recordings, movement data), images (e.g. immunohistochemical images, MRI slices), and spatio-temporal correlations in volume data. Students will also learn how to produce synthetica data from various noise models to assess signal-to-noise ratio in instrumental datasets.

| Module contents | Data types and data structures, control structures, functions, modules, file input/output Standard libraries and SciPy libraries (Matplotlib, NumPy,...), scikit-image, VPython, ... |
| Reader's advisory | open access  
http://www.swaroopch.com/notes/python/  
http://docs.python.org/3/tutorial/index.html |

<table>
<thead>
<tr>
<th>Links</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Language of instruction</td>
<td>English</td>
</tr>
<tr>
<td>Duration (semesters)</td>
<td>1 Semester</td>
</tr>
<tr>
<td>Module frequency</td>
<td>semester break, annually</td>
</tr>
<tr>
<td>Module capacity</td>
<td>20</td>
</tr>
<tr>
<td>Reference text</td>
<td>Shared course components with (cannot be credited twice): pb328 &quot;Einführung in Datenanalyse mit Python&quot; (Professionalisierungsmodul im Bachelorstudium Biologie)</td>
</tr>
<tr>
<td>Modullevel</td>
<td>---</td>
</tr>
<tr>
<td>Modulart</td>
<td>je nach Studiengang Pflicht oder Wahlpflicht</td>
</tr>
</tbody>
</table>

**Lern-/Lehrform / Type of program**

| Vorkenntnisse / Previous knowledge | No prior knowledge in programming required, but useful. |

<table>
<thead>
<tr>
<th>Examination</th>
<th>Time of examination</th>
<th>Type of examination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Final exam of module</td>
<td>term break, immediately after the course (2 weeks in February)</td>
<td>assignment of programming exercises, 4 out of 5 exercises to be assessed</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course type</th>
<th>Comment</th>
<th>SWS</th>
<th>Frequency</th>
<th>Workload attendance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecture</td>
<td></td>
<td>2.00</td>
<td>WiSe</td>
<td>28 h</td>
</tr>
<tr>
<td>Exercises</td>
<td></td>
<td>2.00</td>
<td>WiSe</td>
<td>28 h</td>
</tr>
</tbody>
</table>

| Total time of attendance for the module | 56 h |
# neu790 - Communicating Neuroscience

<table>
<thead>
<tr>
<th>Module label</th>
<th>Communicating Neuroscience</th>
</tr>
</thead>
<tbody>
<tr>
<td>Module code</td>
<td>neu790</td>
</tr>
<tr>
<td>Credit points</td>
<td>3.0 KP</td>
</tr>
<tr>
<td>Workload</td>
<td>90 h</td>
</tr>
<tr>
<td></td>
<td>(28 h contact / 62 h individual reading and preparing discussion questions)</td>
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<tr>
<td>Used in course of study</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Master Biologie &gt; Skills Modules</td>
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<tr>
<td></td>
<td>• Master Neuroscience &gt; Skills Modules</td>
</tr>
<tr>
<td>Contact person</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Module responsibility</td>
</tr>
<tr>
<td></td>
<td>• Jutta Kretzberg</td>
</tr>
<tr>
<td>Authorized examiners</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Jutta Kretzberg</td>
</tr>
<tr>
<td></td>
<td>• Martin Greschner</td>
</tr>
<tr>
<td></td>
<td>• Jannis Hildebrandt</td>
</tr>
<tr>
<td>Entry requirements</td>
<td></td>
</tr>
<tr>
<td>Skills to be acquired in this module</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Neurosci. knowlg.</td>
</tr>
<tr>
<td></td>
<td>• Independent research</td>
</tr>
<tr>
<td></td>
<td>• Scient. Literature</td>
</tr>
<tr>
<td></td>
<td>• Social skills</td>
</tr>
<tr>
<td></td>
<td>• Interdiscipl. knowlg.</td>
</tr>
<tr>
<td></td>
<td>• Data present./disc.</td>
</tr>
<tr>
<td></td>
<td>• Scientific English</td>
</tr>
<tr>
<td></td>
<td>• Ethics</td>
</tr>
<tr>
<td></td>
<td>Upon successful completion of this course, students will have thought about and discussed in depth scientific, social and ethical aspects of neuroscience.</td>
</tr>
<tr>
<td>Critical reading of neuroscience literature:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>identify article type and audience</td>
</tr>
<tr>
<td></td>
<td>summarize scientific contents</td>
</tr>
<tr>
<td></td>
<td>identify strengths and weaknesses of methods, conclusions etc.</td>
</tr>
<tr>
<td></td>
<td>put into scientific context</td>
</tr>
<tr>
<td></td>
<td>discuss manuscript style</td>
</tr>
<tr>
<td></td>
<td>discuss social and ethical context and implications of the study</td>
</tr>
<tr>
<td>Critical discussion of own studies:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>present own results in a way that is appropriate for the target audience</td>
</tr>
<tr>
<td></td>
<td>put own studies into the context of scientific literature</td>
</tr>
<tr>
<td></td>
<td>acquire additional knowledge about a broader field of research</td>
</tr>
<tr>
<td>Module contents</td>
<td>The overall goal of critical discussion of neuroscientific results in a scientific, social and ethical context can be achieved by different options: - Option 1: Seminar 'Neuroscience Journal Club': All students read and discuss 12 published papers (one each week). Different fields of neuroscience (e.g. molecular, cellular, behavioral, computational) will be covered with one classical and one recent paper each. Papers and questions about each paper will be provided prior to the start of the seminar. Students prepare answers to these questions independently and discuss their answers during the seminar. The module is passed when a student actively participated in the discussion of at least 10 papers. - Option 2: Written report on a neuroscientific topic of the student's choice, based on scientific literature, e.g. in the context of an independent student study group. The report should discuss scientific results in a scientific and a social / ethical context. - Option 3: Active participation in a scientific conference, workshop, summer school etc: Participation in a scientific conference, workshop, summer school etc. lasting a minimum of 3 full days can be credited with 3 ECTS, if the student presents own scientific results (poster, talk) obtained, e.g., in a research module or Master thesis. - Option 4: Participation in at least 20 scientific presentations (e.g. IBU / DIN colloquium, Hanse lecture neuroscience) and submission of a short (1 page) written summary of each talk. - For other individual options (e.g. teaching in neuroscience) ask the module organizer.</td>
</tr>
<tr>
<td>Reader's advisory</td>
<td>Option 1 (seminar): List of 12 published papers will be provided prior to the course. All students are required to read at least 10 of those. Other options: dependent on the scientific topic</td>
</tr>
</tbody>
</table>
Background neuroscience textbooks, e.g.:  
Galizia, Lledo 'Neuroscience – From Molecule to Behavior’, 2013, Springer  
Nicholls et al. ‘From Neuron to Brain’, 5th edition 2012, Sinauer  

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<tbody>
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<td>Language of instruction</td>
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<tr>
<td>Duration (semesters)</td>
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<tr>
<td>Module frequency</td>
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<tr>
<td>Module capacity</td>
</tr>
<tr>
<td>Modullevel</td>
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<tr>
<td>Modulart</td>
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</tbody>
</table>

Lern- / Lehrform / Type of program

Vorkenntnisse / Previous knowledge

<table>
<thead>
<tr>
<th>Examination</th>
<th>Time of examination</th>
<th>Type of examination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Final exam of module</td>
<td>none (only pass / fail) depend on the option chosen (see Module content)</td>
<td></td>
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</tbody>
</table>

Course type

<table>
<thead>
<tr>
<th>SWS</th>
<th>Frequency</th>
<th>Workload attendance</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.00</td>
<td>SuSe and WiSe</td>
<td>28 h</td>
</tr>
</tbody>
</table>
neu800 - Introduction to Matlab

Module label: Introduction to Matlab
Module code: neu800
Credit points: 3.0 KP
Workload: 90 h
(2 SWS Supervised exercise (UE) "Introduction to MATLAB" Total workload 90h: 28h contact / 62h practising learned programming skills)

Used in course of study:
- Master Biologie > Skills Modules
- Master Neuroscience > Skills Modules

Contact person:
- Module responsibility: Carsten Gießing
- Authorized examiners: Carsten Gießing

Entry requirements:
Skills to be acquired in this module:
++ Expt. Methods
+ Social skills
+ Interdiscipl. knowlg.
++ Maths/Stats/Progr.
+ Data present./disc.
+ Scientific English

Within this introductory course students will learn the basics of MATLAB programming. Participants will be introduced in fundamental programming concepts.

Module contents:
The modul comprises an introduction to data structures, flow control, loops, graphics, basic data analyses with MATLAB, scripts and functions.

Reader's advisory:

Links:
- Language of instruction: English
- Duration (semesters): 1 Semester
- Module frequency: annually, summer term, second half
- Module capacity: 12 (in total with bio640) (shared course components with (cannot be credited twice): bio640)
- Modullevel: MM (Mastermodul / Master module)
- Modulart: Wahlpflicht / Elective

Lern-Lehrform / Type of program

Vorkenntnisse / Previous knowledge

Examination Time of examination Type of examination
Final exam of module end of summer term Working on exercises
Wregular active participation

Course type Comment SWS Frequency Workload attendance
Lecture 0.00 SuSe 0 h
Seminar 0.00 SuSe 0 h
Exercises 2.00 SuSe 28 h

Total time of attendance for the module 28 h
### neu810 - International Meeting Contribution

<table>
<thead>
<tr>
<th>Module label</th>
<th>International Meeting Contribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Module code</td>
<td>neu810</td>
</tr>
<tr>
<td>Credit points</td>
<td>3.0 KP</td>
</tr>
<tr>
<td>Workload</td>
<td>90 h</td>
</tr>
<tr>
<td>Used in course of study</td>
<td>Master Biologie &gt; Skills Modules</td>
</tr>
<tr>
<td></td>
<td>Master Neuroscience &gt; Skills Modules</td>
</tr>
</tbody>
</table>

**Contact person**
- Module responsibility
  - Jutta Kretzberg
- Authorized examiners
  - Jutta Kretzberg
  - Christine Köppl
  - Jannis Hildebrandt

**Entry requirements**

**Skills to be acquired in this module**
- + Neurosci. knowlg.
- ++ Independent research
- ++ Scient. Literature
- ++ Social skills
- + Interdiscipl. knowlg.
- ++ Data present./disc.
- + Scientific English
- ++ Ethics

Presentation and critical discussion of own studies in front of an international audience:
- participate in an international meeting
- prepare a poster or talk for an international meeting
- present own results in a way that is appropriate for the target audience
- put own studies into the context of scientific literature
- acquire additional knowledge about a broader field of research

**Module contents**
Active participation in a scientific conference, workshop, summer school etc, lasting a minimum of 3 full days. Student must be the presenter (poster or talk) and an author of the presented work, typically carried out in the context of a research module or the Master thesis.

**Reader’s advisory**
dependent on the scientific topic

**Links**
- Language of instruction: English
- Duration (semesters): 1 Semester
- Module frequency: every semester, flexible
- Module capacity: unlimited (please contact module organizer individually)
- Modullevel: MM (Mastermodul / Master module)
- Modular: Wahlpflicht / Elective

**Lern-/Lehrform / Type of program**

**Vorkenntnisse / Previous knowledge**

<table>
<thead>
<tr>
<th>Examination</th>
<th>Time of examination</th>
<th>Type of examination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Final exam of module</td>
<td>none (only pass/fail)</td>
<td></td>
</tr>
</tbody>
</table>

**Course type**
- Seminar

**SWS**
- 0.00

**Frequency**
- SuSe and WiSe

**Workload attendance**
- 0 h
Abschlussmodul

mam - Master´s Thesis Module

<table>
<thead>
<tr>
<th>Module label</th>
<th>Master´s Thesis Module</th>
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</thead>
<tbody>
<tr>
<td>Module code</td>
<td>mam</td>
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<tr>
<td>Credit points</td>
<td>30.0 KP</td>
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<tr>
<td>Workload</td>
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</tr>
<tr>
<td>Used in course of study</td>
<td>Master Biologie &gt; Abschlussmodul</td>
</tr>
</tbody>
</table>

Contact person

- Lehrende der Biologie
- Authorized examiners
- Lehrende der Biologie

Entry requirements

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 in German and English (written and spoken)
- teamwork
- ethics and professional behaviour
- ** project and time management

Module contents

Preparing the Master thesis

Active participation in the seminar of the research group, in which the Master thesis is written.

Reader's advisory

Supervisors may supply an initial reading list with important literature. The students are expected to find and use further literature as needed.

Links

Languages of instruction

- English
- German

Duration (semesters)

1 Semester

Module frequency

Semiannual

Module capacity

Unlimited

Modulelevel

MM (Mastermodul / Master module)

Modulart

Pflicht / Mandatory

Lern-/Lehrform / Type of program

Vorkenntnisse / Previous knowledge

Examination | Time of examination | Type of examination
---|---|---
Final exam of module | | master's thesis (90%)  
Final colloquium (10%)  
Course type

Seminar

SWS

2.00

Frequency

SuSe and WiSe

Workload attendance

28 h