## Modules for Biology

### Background Modules

**bio703 - Basic Concepts in Plant Sciences**

<table>
<thead>
<tr>
<th>Label</th>
<th>Basic Concepts in Plant Sciences</th>
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<tbody>
<tr>
<td>Module code</td>
<td>bio703</td>
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<tr>
<td>Credit points</td>
<td>12.0 KP</td>
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<tr>
<td>Workload</td>
<td>360 h</td>
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<tr>
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<td>Master Biologie &gt; Background Modules</td>
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**Contact person**

- Module responsibility
  - Dirk Carl Albach

- Authorized examiners
  - Dirk Carl Albach
  - Gerhard Wolfgang Zotz
  - Sascha Laubinger
  - Klaus Bernhard von Hagen

**Module counseling**

- Gerhard Wolfgang Zotz
- Sascha Laubinger
- Klaus Bernhard von Hagen

**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 (2 SWS)

**Reader's advisory**


**Links**

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

**Reference text**

- associated with bio765 (Current Methods in Plant Science) (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: 1 Portfolio (40%), 1 report (60%)
- Course type: Comment, SWS, Frequency, Workload attendance
<table>
<thead>
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<th>Comment</th>
<th>SWS</th>
<th>Frequency</th>
<th>Workload attendance</th>
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<td>4.00</td>
<td>WiSe</td>
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<tr>
<td>Seminar</td>
<td></td>
<td>4.00</td>
<td>WiSe</td>
<td>56 h</td>
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**Total time of attendance for the module**

112 h
## 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>Credit points</td>
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<tr>
<td>Workload</td>
<td>360 h</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
- **Skills to be acquired in this module**
  - Acquaintance and practicing ecological, phylogenetic and molecular methods
  - Communication of scale- and method-overarching thinking and project planning
  - Knowledge of current methods and questions in plant science
  - Capacity for teamwork, project- and time management
  - ++ deepened biological expertise
  - ++ deepened knowledge of biological working methods
  - ++ data analysis skills
  - ++ interdisciplinary thinking
  - + critical and analytical thinking
  - + independent searching and knowledge of scientific literature
  - + ability to perform independent biological research
  - + data presentation and discussion in German and English (written and spoken)
  - + teamwork
  - + statistics & scientific programming

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

### Reader's advisory

### Links
- 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

<table>
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<tr>
<th>Module label</th>
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<tr>
<td>Module code</td>
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<td>Workload</td>
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#### Contact person

- **Module responsibility**
  - Franz Bairlein
- **Authorized examiners**
  - Georg Martin Klump
  - Sandra Bouwhuis
  - Christine Köppl
  - Ulrike Langemann
  - Henrik Mouritsen
  - Heiko Schmaljohann
  - Franz Bairlein

- **Module counseling**
  - Georg Martin Klump
  - Sandra Bouwhuis
  - Christine Köppl
  - Ulrike Langemann
  - Henrik Mouritsen
  - Heiko Schmaljohann
  - Franz Bairlein

#### Entry requirements

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)

#### Skills to be acquired in this module

- 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

### 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


Links
Participating Institution: Institut für Vogelforschung
http://www.ifv-vogelwarte.de

Languages of instruction
German, English

Duration (semesters)
1 Semester

Module frequency

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<th>Module capacity</th>
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Reference text
associated with bio900

Modullevel
MM (Mastermodul / Master module)

Modulart
je nach Studiengang Pflicht oder Wahlpflicht

Lern-/Lehrform / Type of program

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<th>Type of examination</th>
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<tr>
<td>Final exam of module</td>
<td>Presentations 40% (the main seminar is mandatory, one of the two options one need to be taken) Written examination 60% Regular active participation is required for the module to be passed successfully.</td>
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<th>Comment</th>
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<th>Workload attendance</th>
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<tr>
<td>Seminar</td>
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<td>4.00</td>
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<td>56 h</td>
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Total time of attendance for the module
112 h
### bio770 - Field Methods in Organismal Biology

<table>
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<td>Credit points</td>
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<tr>
<td>Workload</td>
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<td>Used in course of study</td>
<td>• Master Biologie &gt; Background Modules</td>
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#### 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/](http://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

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<td>Presentation(s) (30 %)</td>
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<td></td>
<td></td>
<td>Laboratory course report on project work (70 %)</td>
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**Total time of attendance for the module**

168 h
**bio720 - Marine Biodiversity**

<table>
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<td>Workload</td>
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<td>• Master Biologie &gt; Background Modules</td>
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**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
  - Written examination (60 %)
  - Presentation(s) (40 %)
  - Regular active participation is required for the module to be passed.

**Course type**

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<td>Lecture</td>
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<tr>
<td>Exercises</td>
<td>9.00</td>
<td>WiSe</td>
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<td>SWS</td>
<td>Frequency</td>
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<tr>
<td>Seminar</td>
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<td>WiSe</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.

Should 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/bibliography/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

Modulelevel

MM (Mastermodul / Master module)

Modulart

Wahlpflicht / Elective

Vorkenntnisse / Previous knowledge

Examination

Time 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 code: bio733  
Credit points: 6.0 KP  
Workload: 180 h  

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: 1

Module capacity: 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:
- Time of examination
- Type of examination: portfolio (60%) presentation (40%)

Final exam of module:

Course type:
- Lecture: 1.00 SWS WiSe Frequency 14 h Workload attendance 14 h
- Exercises: 3.00 SWS WiSe 42 h

Total time of attendance for the module: 56 h
bio736 - Evolutionary Transcriptomics

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

Reference text

- associated with bio733: Evolutionary Biology Population Genetics (recommended)

Modullevel

- MM (Mastermodul / Master module)

Modulart

- Wahlpflicht / Elective

Lern-/Lehrform / Type of program

Vorkenntnisse / Previous knowledge

- Evolutionary Biology

Examination

- Time of examination
- Type of examination
- portfolio (60%)
- presentation (40%)

Final exam of module

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
### 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

### Examination

**Time of examination**

Final exam of module during the module

**Type of examination**

Präsentationen (50%), Portfolio (50%). Regular participation is a prerequisite to pass in the module.

**Course type**

<table>
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<th>Description</th>
<th>SWS</th>
<th>Frequency</th>
<th>Workload attendance</th>
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<td>SWS</td>
<td>Frequency</td>
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bio605 - Molecular Genetics and Cell Biology

Module label | Molecular Genetics and Cell Biology
---|---
Module code | bio605
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
  - 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/

Language of instruction
English

Duration (semesters)
1 Semester

Module frequency
Module capacity
15
Reference text
associated with bio900

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

Course type
Comment
SWS
Frequency
Workload attendance
Lecture
2.00
WiSe
28 h
<table>
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<tr>
<td>Seminar</td>
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<td>1.00</td>
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<td>14 h</td>
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<td>5.00</td>
<td>WiSe</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>
<td>6.0 KP</td>
</tr>
<tr>
<td>Workload</td>
<td>180 h</td>
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<tr>
<td>Used in course of study</td>
<td>• Master Biologie &gt; Background Modules • Master Neuroscience &gt; Background Modules</td>
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## 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.

Lecture topics:

- Introduction to Developmental Biology
- Cell-Cell Communication
- Differential Gene Expression (I and II)
- Early Development of Vertebrates, Gastrulation
- Neurulation
- Brain Development
- Axonal Growth, Target Selection, Synaptogenesis and Refinement
- Neural Crest
- Mesoderm Development
- 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**
- **Module capacity**: 20 (selection criteria: sequence of registration)
<table>
<thead>
<tr>
<th>Reference text</th>
<th>associated with bio846 (previously neu120) (Lab Exercises in Development and Evolution)</th>
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<td>Modulart</td>
<td>Wahlpflicht / Elective</td>
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<td>Lern-/Lehrform / Type of program</td>
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<tr>
<td>Vorkenntnisse / Previous knowledge</td>
<td>organismic biology, developmental biology, evolutionary biology, neurobiology, genetics, molecular biology</td>
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<td>Examination</td>
<td>Time of examination</td>
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<td>Final exam of module</td>
<td>same winter term</td>
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<th>SWS</th>
<th>Frequency</th>
<th>Workload attendance</th>
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<td>Lecture</td>
<td></td>
<td>2.00</td>
<td>WiSe</td>
<td>28 h</td>
</tr>
<tr>
<td>Seminar</td>
<td></td>
<td>2.00</td>
<td>WiSe</td>
<td>28 h</td>
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**Total time of attendance for the module**: 56 h
## Module Details

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<td>6.0 KP</td>
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<tr>
<td><strong>Workload</strong></td>
<td>180 h</td>
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<tr>
<td><strong>Used in course of study</strong></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><strong>Contact person</strong></td>
<td>Ulrike Sienknecht</td>
</tr>
<tr>
<td><strong>Authorized examiners</strong></td>
<td>Ulrike Sienknecht</td>
</tr>
<tr>
<td>              </td>
<td>Hans Gerd Nothwang</td>
</tr>
<tr>
<td><strong>Module Counciling</strong></td>
<td>Hans Gerd Nothwang</td>
</tr>
</tbody>
</table>

### Entry Requirements

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)
### Reference text
Associated with bio845 (previously neu110) (Introduction to Development and Evolution)

### Modullevel
MM (Mastermodul / Master module)

### Modulart
Wahlpflicht / Elective

### Lern-/Lehrform / Type of program

<table>
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<th>Vorkenntnisse / Previous knowledge</th>
<th>organisic biology, evolutionary biology, neurobiology, genetics, molecular biology, experience with lab work</th>
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### Examination

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<th>Time of examination</th>
<th>Type of examination</th>
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<td>report (50%) and presentation (50%)</td>
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### Course type

<table>
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<td></td>
<td>0.50</td>
<td>WSe</td>
<td>7 h</td>
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<td>Exercises</td>
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<td>3.00</td>
<td>WSe</td>
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### Total time of attendance for the module
56 h
**bio860 - Comparative Developmental Biology**

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<td>Workload</td>
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<td>Used in course of study</td>
<td>Master Biologie &gt; Background Modules</td>
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**Contact person**

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

**Entry requirements**

- ++ 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
- Type of examination: Final exam of module

**Examination**

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**Final exam of module**

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<td>3.00</td>
<td>SuSe</td>
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**Total time of attendance for the module**: 56 h
bio695 - Biochemical concepts in signal transduction

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<td>Workload</td>
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<td>- Master Biologie &gt; Background Modules</td>
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<td>- Master Neuroscience &gt; Background Modules</td>
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<tr>
<td>Contact person</td>
<td>Module responsibility</td>
</tr>
<tr>
<td></td>
<td>- Karl-Wilhelm Koch</td>
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<tr>
<td>Authorized examiners</td>
<td>- Karl-Wilhelm Koch</td>
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<td></td>
<td>- Alexander Scholten</td>
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<td></td>
<td>- Alexander Scholten</td>
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<td>Entry requirements</td>
<td>Skills to be acquired in this module</td>
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<tr>
<td></td>
<td>++ deepened biological expertise</td>
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<tr>
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<td>++ deepened knowledge of biological working methods</td>
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<tr>
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<td>++ data analysis skills</td>
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<td></td>
<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>++ data presentation and discussion in German and English (written and spoken)</td>
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<td></td>
<td>+ teamwork</td>
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<td>+ project and time management</td>
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<tr>
<td>Module contents</td>
<td>Lecture: Molecular fundamentals of cellular signal processes</td>
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<td></td>
<td>Seminar: Signal transduction</td>
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<td></td>
<td>Exercises: Experiments on cellular signal transduction and enzymology</td>
</tr>
<tr>
<td></td>
<td>Mechanisms of biochemical signal transduction are imparted theoretically and experimentally</td>
</tr>
<tr>
<td>Reader's advisory</td>
<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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<td>Links</td>
<td>Language of instruction</td>
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<tr>
<td></td>
<td>English</td>
</tr>
<tr>
<td>Duration (semesters)</td>
<td>1 Semester</td>
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<tr>
<td>Module frequency</td>
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<tr>
<td>Module capacity</td>
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<td>Modulart</td>
<td>je nach Studiengang Pflicht oder Wahlpflicht</td>
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<tr>
<td>Lern-/Lehrform / Type of program</td>
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<td>Vorkenntnisse / Previous knowledge</td>
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<tr>
<td>Examination</td>
<td>Time of examination</td>
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<tr>
<td>Workload attendance</td>
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# neu210 - Neurosensory Science and Behaviour - Part A

<table>
<thead>
<tr>
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<th>Neurosensory Science and Behaviour - Part A</th>
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<tbody>
<tr>
<td>Module code</td>
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<tr>
<td>Credit points</td>
<td>9.0 KP</td>
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<tr>
<td>Workload</td>
<td>270 h</td>
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| Used in course of study | • Master Biologie > Background Modules  
• Master Neuroscience > Background Modules |

**Contact person**
- Module responsibility
  - Georg Martin Klump
- Authorized examiners
  - Jannis Hildebrandt
  - Georg Martin Klump
  - Ulrike Langemann
  - Henrik Mouritsen
- Module counseling
  - Ulrike Langemann
  - Jannis Hildebrandt
  - Henrik Mouritsen

**Entry requirements**
++ 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
<table>
<thead>
<tr>
<th>Time of examination</th>
<th>Type of examination</th>
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<tr>
<td>as agreed, usually in the break after the winter term</td>
<td>80% written exam (content of the two lecture series), 20% presentation(s)</td>
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### Course type
**Comment**  
**SWS**  
**Frequency**  
**Workload attendance**

<table>
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<th>Comment</th>
<th>SWS</th>
<th>Frequency</th>
<th>Workload attendance</th>
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<td>Frequency</td>
<td>Workload attendance</td>
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<td></td>
<td></td>
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# neu220 - Neurosensory Science and Behaviour - Part B

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<td>Credit points</td>
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<td>• Master Biologie &gt; Background Modules</td>
</tr>
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<td></td>
<td>• Master Neuroscience &gt; Background Modules</td>
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<tr>
<td>Contact person</td>
<td></td>
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<td>Module responsibility</td>
<td>Christiane Margarete Thiel</td>
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<tr>
<td>Authorized examiners</td>
<td>Carsten Gießing</td>
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<td></td>
<td>Christiane Margarete Thiel</td>
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<tr>
<td>Module counseling</td>
<td>Carsten Gießing</td>
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## Entry requirements

++ 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 exercise either deepens that knowledge by exercises 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. |
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</thead>
<tbody>
<tr>
<td><strong>Modullevel</strong></td>
<td>---</td>
</tr>
<tr>
<td><strong>Modulart</strong></td>
<td>je nach Studiengang Pflicht oder Wahlpflicht</td>
</tr>
<tr>
<td><strong>Lern-/Lehrform / Type of program</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Vorkenntnisse / Previous knowledge</strong></td>
<td></td>
</tr>
</tbody>
</table>
| **Examination**   | Time of examination  
Type of examination |                                                            |
| **Final exam of module** | as agreed, usually in the break after the winter term  
100% written exam (content of the lectures) |                                                            |
| **Course type**   | **Comment**  
**SWS**  
**Frequency**  
**Workload attendance** |                                                            |
| Lecture           | 3.00  
--  
42 h |                                                            |
| Exercises         | 1.00  
--  
14 h |                                                            |
| **Total time of attendance for the module** | 56 h |                                                            |
neu141 - Visual Neuroscience - Physiology and Anatomy

<table>
<thead>
<tr>
<th>Module label</th>
<th>Visual Neuroscience - Physiology and Anatomy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Module code</td>
<td>neu141</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></td>
<td>• Master Neuroscience &gt; Background Modules</td>
</tr>
<tr>
<td>Contact person</td>
<td>Module responsibility</td>
</tr>
<tr>
<td></td>
<td>• Martin Greschner</td>
</tr>
<tr>
<td></td>
<td>Authorized examiners</td>
</tr>
<tr>
<td></td>
<td>• Martin Greschner</td>
</tr>
<tr>
<td></td>
<td>• Karin Dedek</td>
</tr>
<tr>
<td></td>
<td>• Ulrike Janssen-Bienhold</td>
</tr>
<tr>
<td></td>
<td>• Christian Puller</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>Module contents</td>
<td></td>
</tr>
<tr>
<td>Reader's advisory</td>
<td></td>
</tr>
<tr>
<td>Links</td>
<td></td>
</tr>
<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></td>
</tr>
<tr>
<td>Module capacity</td>
<td>12 - with Visual Neuroscience: Anatomy</td>
</tr>
<tr>
<td>Modullevel</td>
<td>---</td>
</tr>
<tr>
<td>Modulart</td>
<td>je nach Studiengang Pflicht oder Wahlpflicht</td>
</tr>
<tr>
<td>Lern-/Lehrform / Type of program</td>
<td></td>
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<td>Vorkenntnisse / Previous knowledge</td>
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<td>Examination</td>
<td>Time of examination</td>
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<td></td>
<td>Type of examination</td>
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<tr>
<td>Final exam of module</td>
<td></td>
</tr>
<tr>
<td>Course type</td>
<td>Comment</td>
</tr>
<tr>
<td>Lecture</td>
<td>2.00</td>
</tr>
<tr>
<td>Seminar</td>
<td>2.00</td>
</tr>
<tr>
<td>Exercises</td>
<td>2.00</td>
</tr>
<tr>
<td>Total time of attendance for the module</td>
<td>84 h</td>
</tr>
</tbody>
</table>
neu150 - Neuroanatomy

Module label  Neuroanatomy
Module code  neu150
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 Janssen-Bienhold
Authorized examiners
• Karin Dedek
• Ulrike Janssen-Bienhold
Module counseling
• Karin Dedek

Entry requirements  attendance in pre-meeting


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)
Modulart  Wahlpflicht

Lern-/Lehrform / Type of program
Vorkenntnisse / Previous knowledge

Examination  Time of examination  Type of examination
Final exam of module  summer semester, first half  Portfolio (75 %), report (25%)

Course type  Comment  SWS  Frequency  Workload attendance
Lecture  1.00  SuSe  14 h
Seminar  1.00  SuSe  14 h
Practical  3.00  SuSe  42 h

Total time of attendance for the module  70 h
# neu290 - Biophysics of Sensory Reception

<table>
<thead>
<tr>
<th>Module label</th>
<th>Biophysics of Sensory Reception</th>
</tr>
</thead>
<tbody>
<tr>
<td>Module code</td>
<td>neu290</td>
</tr>
<tr>
<td>Credit points</td>
<td>6.0 KP</td>
</tr>
<tr>
<td>Workload</td>
<td>180 h</td>
</tr>
</tbody>
</table>
| Used in course of study | | Master Biologie > Background Modules  
| | Master Neuroscience > Background Modules |
| Contact person | Module responsibility            |
| | Michael Winkhofer |
| | Authorized examiners |
| | Michael Winkhofer |

## 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

## Modulart

je nach Studiengang Pflicht oder Wahlpflicht

## 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>Final exam of module</td>
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</table>

## Final exam of module

<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>SuSe</td>
<td>28 h</td>
</tr>
<tr>
<td>Seminar</td>
<td></td>
<td>2.00</td>
<td>SuSe</td>
<td>28 h</td>
</tr>
</tbody>
</table>

## Total time of attendance for the module

56 h
# neu360 - Auditory Neuroscience

<table>
<thead>
<tr>
<th>Module label</th>
<th>Auditory Neuroscience</th>
</tr>
</thead>
<tbody>
<tr>
<td>Module code</td>
<td>neu360</td>
</tr>
<tr>
<td>Credit points</td>
<td>6.0 KP</td>
</tr>
<tr>
<td>Workload</td>
<td>180 h</td>
</tr>
</tbody>
</table>
| 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

**Modullevel**

---

**Modulart**

je nach Studiengang Pflicht oder Wahlpflicht

**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>
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<td>HA</td>
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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>2.00</td>
<td>SuSe</td>
<td>28 h</td>
</tr>
<tr>
<td>Seminar</td>
<td></td>
<td>2.00</td>
<td>SuSe</td>
<td>28 h</td>
</tr>
<tr>
<td>Exercises</td>
<td></td>
<td>2.00</td>
<td>SuSe</td>
<td>28 h</td>
</tr>
</tbody>
</table>

**Total time of attendance for the module**

- 84 h
**neu340 - Invertebrate Neuroscience**

<table>
<thead>
<tr>
<th>Module label</th>
<th>Invertebrate Neuroscience</th>
</tr>
</thead>
<tbody>
<tr>
<td>Module code</td>
<td>neu340</td>
</tr>
<tr>
<td>Credit points</td>
<td>6.0 KP</td>
</tr>
<tr>
<td>Workload</td>
<td>180 h</td>
</tr>
<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>
</tr>
</tbody>
</table>
| Used in course of study | • Master Biologie > Background Modules  
• Master Neuroscience > Background Modules |
| Contact person | Module responsibility  
• Jutta Kretzberg  
Authorized examiners  
• Jutta Kretzberg |
| Entry requirements | attendance in pre-meeting |
| Skills to be acquired in this module | ++ Neurosci. knowlg.  
++ Expt. Methods  
+ Scient. Literature  
+ Social skills  
+ Maths/Stats/Progr.  
+ Data present./disc.  
+ Scientific English  
+ Ethics |
| 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 |

**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")

**Module level** ---

**Modulart** je nach Studiengang Pflicht oder Wahlpflicht

**Vorkenntnisse / Previous knowledge** basic knowledge of neurobiology, basic MATLAB programming skills

**Examination**

<table>
<thead>
<tr>
<th>Time of examination</th>
<th>Type of examination</th>
</tr>
</thead>
<tbody>
<tr>
<td>during the course (summer term, second half)</td>
<td>Portfolio consisting of short tests and short reports In addition, mandatory but ungraded: seminar presentation</td>
</tr>
</tbody>
</table>

**Course type**  

<table>
<thead>
<tr>
<th>Comment</th>
<th>SWS</th>
<th>Frequency</th>
<th>Workload attendance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course type</td>
<td>Comment</td>
<td>SWS</td>
<td>Frequency</td>
</tr>
<tr>
<td>-------------</td>
<td>---------</td>
<td>-----</td>
<td>---------------</td>
</tr>
<tr>
<td>Seminar</td>
<td></td>
<td>2.00</td>
<td>SuSe or WiSe</td>
</tr>
<tr>
<td>Exercises</td>
<td></td>
<td>2.00</td>
<td>SuSe or WiSe</td>
</tr>
</tbody>
</table>

**Total time of attendance for the module**  
56 h
### neu300 - Functional MRI data analysis

<table>
<thead>
<tr>
<th>Module label</th>
<th>Functional MRI data analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Module code</td>
<td>neu300</td>
</tr>
<tr>
<td>Credit points</td>
<td>12.0 KP</td>
</tr>
<tr>
<td>Workload</td>
<td>360 h</td>
</tr>
</tbody>
</table>
| Used in course of study | - Master Biologie > Background Modules  
 - Master Neuroscience > Background Modules |
| Contact person        |                              |
| Module responsibility | Carsten Gießing             |
| Authorized examiners  | Christiane Margarete Thiel  |

**Entry requirements**

**Skills to be acquired in this module**

**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**

<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>Comment</td>
<td>SWS</td>
</tr>
<tr>
<td>Practical</td>
<td>5.00</td>
<td>SuSe</td>
</tr>
<tr>
<td>Seminar</td>
<td>1.00</td>
<td>SuSe</td>
</tr>
<tr>
<td>Lecture</td>
<td>2.00</td>
<td>SuSe</td>
</tr>
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</table>

**Total time of attendance for the module**

- 112 h
# neu310 - Psychophysics of Hearing

**Module label**  
Psychophysics of Hearing

**Module code**  
neu310

**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**
  - Georg Martin Klump

- **Authorized examiners**
  - Georg Martin Klump
  - Ulrike Langemann

**Entry requirements**

**Skills to be acquired in this module**

**Reader's advisory**

**Links**

**Language of instruction**  
English

**Duration (semesters)**  
1 Semester

**Module frequency**

**Module capacity**  
6 (in total with bio640)

**Modullevel**  
---

**Modulart**  
je nach Studiengang Pflicht oder Wahlpflicht

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

**Vorkenntnisse / Previous knowledge**

**Examination**

<table>
<thead>
<tr>
<th>Examination</th>
<th>Time of examination</th>
<th>Type of examination</th>
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<tbody>
<tr>
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<td>Comment</td>
<td>SWS</td>
</tr>
<tr>
<td>Exercises</td>
<td>1.00</td>
<td>SuSe</td>
</tr>
<tr>
<td>Seminar</td>
<td>2.00</td>
<td>SuSe</td>
</tr>
<tr>
<td>Practical</td>
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<td>SuSe</td>
</tr>
<tr>
<td>Lecture</td>
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<td>SuSe</td>
</tr>
<tr>
<td><strong>Total time of attendance for the module</strong></td>
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</table>
# Research Modules

## bio900 - Biology Research Module

<table>
<thead>
<tr>
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<th>Biology Research Module</th>
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<tbody>
<tr>
<td>Module code</td>
<td>bio900</td>
</tr>
<tr>
<td>Credit points</td>
<td>15.0 KP</td>
</tr>
<tr>
<td>Workload</td>
<td>450 h</td>
</tr>
<tr>
<td>Used in course of study</td>
<td>• Master Biologie &gt; Research Modules</td>
</tr>
</tbody>
</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**

**Links**

**Languages of instruction**

German, English

**Duration (semesters)**

1 Semester

**Module frequency**

unlimited

**Module capacity**

unlimited

**Reference text**

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

**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>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Final exam of module</td>
</tr>
</tbody>
</table>

**Course type**

Projektorientiertes Modul

**SWS**

10.00

**Frequency**

SuSe and WiSe

**Workload attendance**

140 h
### bio810 - Independent Research

<table>
<thead>
<tr>
<th>Module label</th>
<th>Independent Research</th>
</tr>
</thead>
<tbody>
<tr>
<td>Module code</td>
<td>bio810</td>
</tr>
<tr>
<td>Credit points</td>
<td>15.0 KP</td>
</tr>
<tr>
<td>Workload</td>
<td>450 h</td>
</tr>
<tr>
<td>Used in course of study</td>
<td>• Master Biologie &gt; Research Modules</td>
</tr>
</tbody>
</table>

#### Contact person
- Module responsibility
  - Gerhard Wolfgang Zotz
- Authorized examiners
  - Gerhard Wolfgang Zotz

#### 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

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
- varies with chosen topic

#### Links
- Language of instruction: English
- Duration (semesters): 1 Semester
- Module frequency: halbjährlich
- Module capacity: unlimited
- Modullevel: MM (Mastermodul / Master module)
- Modulart: Wahlpflicht / Elective

#### Lern-/Lehrform / Type of program

**Vorkenntnisse / Previous knowledge**

**Examination**

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

**Course type**

<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>SuSe and WiSe</td>
<td>14 h</td>
</tr>
<tr>
<td>Projektorientiertes Modul</td>
<td></td>
<td>10.00</td>
<td>SuSe and WiSe</td>
<td>140 h</td>
</tr>
</tbody>
</table>

**Total time of attendance for the module**
- 154 h
### bio820 - Research Module Fast Track

<table>
<thead>
<tr>
<th><strong>Module label</strong></th>
<th>Research Module Fast Track</th>
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</thead>
<tbody>
<tr>
<td><strong>Module code</strong></td>
<td>bio820</td>
</tr>
<tr>
<td><strong>Credit points</strong></td>
<td>15.0 KP</td>
</tr>
<tr>
<td><strong>Workload</strong></td>
<td>450 h</td>
</tr>
<tr>
<td><strong>Used in course of study</strong></td>
<td>Master Biologie &gt; Research Modules</td>
</tr>
</tbody>
</table>

**Contact person**
- Module responsibility
  - Georg Martin Klump
- Authorized examiners
  - Georg Martin Klump

**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

**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**

<table>
<thead>
<tr>
<th><strong>Examination</strong></th>
<th><strong>Time of examination</strong></th>
<th><strong>Type of examination</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Final exam of module</td>
<td></td>
<td>written report</td>
</tr>
</tbody>
</table>

**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>
</tr>
</thead>
<tbody>
<tr>
<td>Module code</td>
<td>bio870</td>
</tr>
<tr>
<td>Credit points</td>
<td>6.0 KP</td>
</tr>
<tr>
<td>Workload</td>
<td>180 h</td>
</tr>
</tbody>
</table>

**Used in course of study**
- Master Biologie > Skills Modules

**Contact person**
- Module responsibility
  - Gerhard Wolfgang Zotz

**Authorized examiners**
- Gerhard Wolfgang Zotz
- Sascha Laubinger
- Dirk Carl Albach

**Module counseling**
- Sascha Laubinger
- Dirk Carl Albach

**Entry requirements**

**Skills to be acquired in this module**
- Communicating and practicing scientific presentation techniques (talk, publication, poster)
- Presentation of data and discussion in spoken and written (english)
- Communicating of techniques in problem treatment in free speech and scientific writing
- Independent investigation and knowledge of scientific primary literature
- + interdisciplinary thinking
- ++ critical and analytical thinking
- ++ independent searching and knowledge of scientific literature
- ++ data presentation and discussion 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 (2SWS)

**Reader’s advisory**

**Links**
- Languages of instruction: German, English
- Duration (semesters): 1 Semester
- Module frequency: 12
- Module capacity: 12
- Modullevel: MM (Mastermodul / Master module)
- Modulart: Wahlmodul / Opportunity

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

**Vorkenntnisse / Previous knowledge**
- Ecology, Flora, Genetics

**Examination**

<table>
<thead>
<tr>
<th>Time of examination</th>
<th>Type of examination</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 presentation (25%)</td>
</tr>
<tr>
<td></td>
<td>1 report (75%)</td>
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</table>

**Course type**
- Seminar

**SWS**
- 4.00

**Frequency**
- WiSe

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

Module label: Skills in Plant Systematics
Module code: bio880
Credit points: 6.0 KP
Workload: 180 h
Used in course of study: Master Biologie > Skills Modules

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
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
Modullevel: MM (Mastermodul / Master module)
Modulart: Wahlmodul / Opportunity

Lern-/Lehrform / Type of program
Vorkenntnisse / Previous knowledge: good knowledge of local flora

Examination
Time of examination
Type of examination

Final exam of module
1 presentation
1 report

Course type
Comment
SWS
Frequency
Workload attendance
Seminar
2.00
WiSe
28 h
Exercises
2.00
WiSe
28 h

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 level
Module frequency
unlimited
Modulelevel MM (Mastermodul / Master module)
Modulart 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

<table>
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<tr>
<th>Module label</th>
<th>Basics of Statistical Data Analysis</th>
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</thead>
<tbody>
<tr>
<td>Module code</td>
<td>neu770</td>
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<tr>
<td>Credit points</td>
<td>6.0 KP</td>
</tr>
<tr>
<td>Workload</td>
<td>180 h</td>
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<tr>
<td></td>
<td>(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)</td>
</tr>
</tbody>
</table>
| 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 | + Social skills  
+ Interdiscipl. knowl.  
++ Maths/Stats/Progr.  
+ Scientific English |
| Skills to be acquired in this module | 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 |
| Final exam of module | after the course | written exam, 2h |
| Course type | Comment | SWS | Frequency | Workload attendance |
| Lecture | 2.00 | | | 28 h |
| Seminar | 2.00 | | | 28 h |
| Total time of attendance for the module | | | | 56 h |
neu720 - Statistical programming in R

<table>
<thead>
<tr>
<th>Module label</th>
<th>Statistical programming in R</th>
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</thead>
<tbody>
<tr>
<td>Module code</td>
<td>neu720</td>
</tr>
<tr>
<td>Credit points</td>
<td>6.0 KP</td>
</tr>
<tr>
<td>Workload</td>
<td>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)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Used in course of study</th>
<th>Master Biologie &gt; Skills Modules</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Master Neuroscience &gt; Skills Modules</td>
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<table>
<thead>
<tr>
<th>Contact person</th>
<th>Module responsibility</th>
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</thead>
<tbody>
<tr>
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<td>Fabian Otto-Sobotka</td>
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| Authorized examiners    | Fabian Otto-Sobotka    |

<table>
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<tr>
<th>Entry requirements</th>
<th>Skills to be acquired in this module</th>
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<tbody>
<tr>
<td></td>
<td>+ Social skills</td>
</tr>
<tr>
<td></td>
<td>+ Interdiscipl. knowlg.</td>
</tr>
<tr>
<td></td>
<td>++ Maths/Stats/Progr.</td>
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<td></td>
<td>+ Scientific English</td>
</tr>
</tbody>
</table>

| 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. |

|                        | R Core Team - R: A language and environment for statistical computing (Reference Manual) |

<table>
<thead>
<tr>
<th>Links</th>
<th>Language of instruction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>English</td>
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</table>

| 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 | basic statistical knowledge including regression analysis |

<table>
<thead>
<tr>
<th>Examination</th>
<th>Time of examination</th>
<th>Type of examination</th>
</tr>
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</table>

| Final exam of module    | after the course      | practical exercise  |

<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>2.00</td>
<td>SuSe</td>
<td>28 h</td>
<td></td>
</tr>
<tr>
<td>Exercises</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 |

<table>
<thead>
<tr>
<th>Workload attendance</th>
<th></th>
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</table>

| Workload attendance       |          |
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 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 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
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- 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 Sonderpädagogik > Fachnahe Angebote Biologie
- Zwei-Fächer-Bachelor Sozialwissenschaften > 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
- Christine Köppl
- Ulrike Sienknecht
Module counceling
- Ulrike Sienknecht

Entry requirements
Skills to be acquired in this module
+ Scient. Literature
++ Social skills
Upon completion of this course, students

- 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
- are 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
- are 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
- **Lern-/Lehrform / Type of program**: je nach Studiengang Pflicht oder Wahlpflicht

**Vorkenntnisse / Previous knowledge**: Fundamentals of genetics, physiology, ecology and biological systematics

**Examination**

**Final exam of module**: within a few weeks of summer term lecture period

Term paper

In addition, mandatory but ungraded: Regular participation during the semester is required (max 3 days of absence)

**Course type**

<table>
<thead>
<tr>
<th>Lecture</th>
<th>Comment</th>
<th>SWS</th>
<th>Frequency</th>
<th>Workload attendance</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>2.00</td>
<td>SuSe</td>
<td>28 h</td>
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</table>

**Seminar und Übung**

<table>
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<tr>
<th>Seminar und Übung</th>
<th>SWS</th>
<th>Frequency</th>
<th>Workload attendance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2.00</td>
<td>SuSe</td>
<td>28 h</td>
</tr>
</tbody>
</table>

**Total time of attendance for the module**

56 h
# neu740 - Molecular Mechanisms of Ageing

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

## 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 more...
- 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
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- Fach-Bachelor Pädagogisches Handeln in der Migrationsgesellschaft > Fachnahe Angebot Biologie
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- Zwei-Fächer-Bachelor Ev. Theologie und Religionspädagogik > Fachnahe Angebote Biologie
- Zwei-Fächer-Bachelor Gender Studies > Fachnahe Angebote Biologie
- Zwei-Fächer-Bachelor Germanistik > Fachnahe Angebote Biologie
- Zwei-Fächer-Bachelor Geschichte > Fachnahe Angebote Biologie
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- 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

<table>
<thead>
<tr>
<th>Module responsibility</th>
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<tbody>
<tr>
<td>Kathrin Thedieck</td>
</tr>
<tr>
<td>Lena Ebbers</td>
</tr>
</tbody>
</table>

## Authorized examiners

<table>
<thead>
<tr>
<th>Authorized examiners</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kathrin Thedieck</td>
</tr>
</tbody>
</table>

## Entry requirements

### Skills to be acquired in this module
- Neurosci. knowlg.
- Exp. methods
- Scient. literature
- Social skills
- Interdiscipl. knowlg.
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
- presentation of results with different presentation techniques

**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
Altern : Zelluläre und molekulare Grundlagen, körperliche Veränderungen und Erkrankungen, Therapieansätze?
Ludger Rensing ; Volkhard Rippe

**Links**

**Language of instruction**

English

**Duration (semesters)**

1 Semester

**Module frequency**

annually, summer term

**Module capacity**

16

**Modulart**

je nach Studiengang Pflicht oder Wahlpflicht

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

**Vorkenntnisse / Previous knowledge**

**Examination**

Time of examination: end of semester

Type of examination: portfolio: thesis paper, oral presentation, poster
<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>presentation In addition, mandatory but ungraded: questionnaire on ageing theories, meeting protocols</td>
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<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>
<td>Lecture</td>
<td></td>
<td>2.00</td>
<td>SuSe</td>
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<td>4.00</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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<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</td>
</tr>
<tr>
<td>(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>
<td></td>
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<tr>
<td>Used in course of study</td>
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<tr>
<td></td>
<td>• Master Biologie &gt; Skills Modules</td>
</tr>
<tr>
<td></td>
<td>• Master Neuroscience &gt; Skills Modules</td>
</tr>
<tr>
<td>Contact person</td>
<td></td>
</tr>
<tr>
<td>Module responsibility</td>
<td></td>
</tr>
<tr>
<td></td>
<td>» Christine Köppl</td>
</tr>
<tr>
<td>Authorized examiners</td>
<td></td>
</tr>
<tr>
<td></td>
<td>» Christine Köppl</td>
</tr>
<tr>
<td></td>
<td>» Georg Martin Klump</td>
</tr>
<tr>
<td></td>
<td>» Ulrike Langemann</td>
</tr>
<tr>
<td></td>
<td>» Arne Nolte</td>
</tr>
<tr>
<td>Entry requirements</td>
<td></td>
</tr>
<tr>
<td>Skills to be acquired in this module</td>
<td>++ Expt. Methods</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>+ Scientific English</td>
</tr>
<tr>
<td></td>
<td>++ Ethics</td>
</tr>
<tr>
<td>Upon successful completion of this course, students</td>
<td>• know the relevant EU legislation governing animal welfare and are able to explain its meaning in common language</td>
</tr>
<tr>
<td></td>
<td>• understand and are able to critically discuss salient ethical concepts in animal experimentation, such as the three Rs and humane endpoint.</td>
</tr>
<tr>
<td></td>
<td>• have basic knowledge of the biology and husbandry of laboratory animal species held at the University of Oldenburg (rodents or birds or fish)</td>
</tr>
<tr>
<td></td>
<td>• are able to critically assess the needs and welfare of animals without compromising scientific integrity of the investigation</td>
</tr>
<tr>
<td></td>
<td>• have practical skills in handling small rodents or birds or fish</td>
</tr>
<tr>
<td></td>
<td>• have profound knowledge of anaesthesia, analgesia and basic principles of surgery.</td>
</tr>
<tr>
<td></td>
<td>• have practised invasive procedures and euthanasia.</td>
</tr>
<tr>
<td>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.</td>
<td></td>
</tr>
<tr>
<td>Module contents</td>
<td></td>
</tr>
<tr>
<td>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</td>
<td></td>
</tr>
<tr>
<td>Reader's advisory</td>
<td>&quot;LAS interactive“ internet-based learning platform</td>
</tr>
<tr>
<td>Links</td>
<td></td>
</tr>
<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, every semester</td>
</tr>
<tr>
<td>Module capacity</td>
<td>15 ( Registration procedure / selection criteria: StudIP, sequence of registration )</td>
</tr>
<tr>
<td>Modullevel</td>
<td>---</td>
</tr>
<tr>
<td>Modulart</td>
<td>je nach Studiengang Pflicht oder Wahlpflicht</td>
</tr>
<tr>
<td>Lern-Lehrform / Type of program</td>
<td></td>
</tr>
<tr>
<td>Vorkenntnisse / Previous knowledge</td>
<td></td>
</tr>
<tr>
<td>Examination</td>
<td>Time of examination</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>-------------------------------</td>
</tr>
<tr>
<td>Final exam of module</td>
<td>immediately before the practical part</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>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>
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</table>

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

<table>
<thead>
<tr>
<th>Module label</th>
<th>Scientific English</th>
</tr>
</thead>
<tbody>
<tr>
<td>Module code</td>
<td>neu760</td>
</tr>
<tr>
<td>Credit points</td>
<td>6.0 KP</td>
</tr>
<tr>
<td>Workload</td>
<td>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)</td>
</tr>
</tbody>
</table>
| 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 are able to express themselves with correct sentence structure and grammar, correct use of idioms and correct pronunciation are proficient in different contexts of scientific communication (e.g., paper, poster and informal exchange by email or phone) are able to recognize and avoid common errors of non-native speakers.

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

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

**Reader's advisory**

http://users.wpi.edu/~nab/sci_eng/ScientificEnglish.pdf

**Links**

<table>
<thead>
<tr>
<th>Language of instruction</th>
<th>English</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duration (semesters)</td>
<td>1 Semester</td>
</tr>
<tr>
<td>Module frequency</td>
<td>annually, semester break</td>
</tr>
<tr>
<td>Module capacity</td>
<td>12</td>
</tr>
</tbody>
</table>

| 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**

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<table>
<thead>
<tr>
<th>Modulart</th>
<th>je nach Studiengang Pflicht oder Wahlpflicht</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lern-/Lehrform / Type of program</td>
<td></td>
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<tr>
<td>Vorkenntnisse / Previous knowledge</td>
<td>English level B2 according to Common European Framework of Reference for Languages (CEFR)</td>
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<tr>
<td>Examination</td>
<td>Time of examination</td>
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<tr>
<td>Final exam of module</td>
<td>within 2 months of completing the course</td>
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<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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<tr>
<td>Total time of attendance for the module</td>
<td></td>
<td></td>
<td></td>
<td>56 h</td>
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</table>
**neu780 - Introduction to Data Analysis with Python**

<table>
<thead>
<tr>
<th>Module label</th>
<th>Introduction to Data Analysis with Python</th>
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</thead>
<tbody>
<tr>
<td>Module code</td>
<td>neu780</td>
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<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>
<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>
<tr>
<td>Contact person</td>
<td>Module responsibility</td>
</tr>
<tr>
<td></td>
<td>• Michael Winkhofer</td>
</tr>
<tr>
<td>Authorized examiners</td>
<td>• Michael Winkhofer</td>
</tr>
<tr>
<td>Entry requirements</td>
<td>Skills to be acquired in this module</td>
</tr>
<tr>
<td></td>
<td>• Neurosci. knowlg.</td>
</tr>
<tr>
<td></td>
<td>•+ Maths/Stats/Progr.</td>
</tr>
<tr>
<td></td>
<td>•+ Data present./disc.</td>
</tr>
<tr>
<td>The objective of the module</td>
<td>is the acquisition of programming skills with focus on analysis of neurobiological datasets, using the programming language python. Python is available for any computer platform (PC, Mac, Linux) and is open source (for free), see <a href="https://www.python.org/">https://www.python.org/</a>.</td>
</tr>
<tr>
<td>Students will learn</td>
<td>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).</td>
</tr>
<tr>
<td>Typical applications</td>
<td>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.</td>
</tr>
<tr>
<td>Module contents</td>
<td>Data types and data structures, control structures, functions, modules, file input/output Standard libraries and SciPy libraries (Matplotlib, NumPy,...), scikit-image, VPython, ...</td>
</tr>
<tr>
<td>Reader's advisory</td>
<td>open access</td>
</tr>
<tr>
<td>Links</td>
<td></td>
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<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>
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<tr>
<td>Reference text</td>
<td>Shared course components with (cannot be credited twice): pb328 &quot;Einführung in Datenanalyse mit Python&quot; (Professionalisierungsmodul im Bachelorstudiengang Biologie)</td>
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<tr>
<td>Modullevel</td>
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<tr>
<td>Modularit</td>
<td>je nach Studiengang Pflicht oder Wahlpflicht</td>
</tr>
<tr>
<td>Vorkenntnisse / Previous knowledge</td>
<td>No prior knowledge in programming required, but useful.</td>
</tr>
<tr>
<td>Examination</td>
<td>Time of examination</td>
</tr>
<tr>
<td>Final exam of module</td>
<td>term break, immediately after the course (2 weeks in February)</td>
</tr>
<tr>
<td>assignment of programming exercises, 4 out of 5 exercises to be assessed</td>
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<td>Course type</td>
<td>Comment</td>
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<tr>
<td>Lecture</td>
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<tr>
<td>Exercises</td>
<td>2.00</td>
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<tr>
<td>Total time of attendance for the module</td>
<td>56 h</td>
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</table>
neu790 - Communicating Neuroscience

Module label
Communicating Neuroscience

Module code
neu790

Credit points
3.0 KP

Workload
90 h
(28 h contact / 62 h individual reading and preparing discussion questions)

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

Contact person
Module responsibility
- Jutta Kretzberg

Authorized examiners
- Jutta Kretzberg
- Jannis Hildebrandt
- Christine Köppel

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

Upon successful completion of this course, students will have thought about and discussed in depth scientific, social and ethical aspects of neuroscience.

Critical reading of neuroscience literature:
identify article type and audience
summarize scientific contents
identify strengths and weaknesses of methods, conclusions etc.
present scientific context
discuss manuscript style
discuss social and ethical context and implications of the study

Critical discussion of own studies:

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
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.

Reader's advisory
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
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

<table>
<thead>
<tr>
<th>Links</th>
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<tbody>
<tr>
<td>Language of instruction</td>
</tr>
<tr>
<td>Duration (semesters)</td>
</tr>
<tr>
<td>Module frequency</td>
</tr>
<tr>
<td>Module capacity</td>
</tr>
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<td>Registration procedure / selection criteria: StudIP</td>
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<tbody>
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<td>Vorkenntnisse / Previous knowledge</td>
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<tr>
<td>Examination</td>
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<td>(see Module content)</td>
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<td>SuSe and WiSe</td>
</tr>
<tr>
<td>Workload attendance</td>
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</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)

Modulelevel
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
Regular 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>
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<th>Module label</th>
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<tr>
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<td>neu810</td>
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<tr>
<td>Credit points</td>
<td>3.0 KP</td>
</tr>
<tr>
<td>Workload</td>
<td>90 h</td>
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<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>
<tr>
<td>Contact person</td>
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<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>• Christine Köppl</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>+ Neurosci. knowlg.</td>
</tr>
<tr>
<td></td>
<td>++ Independent research</td>
</tr>
<tr>
<td></td>
<td>++ Scient. Literature</td>
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<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>Presentation and critical discussion of own studies in front of an international audience:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>participate in an international meeting</td>
</tr>
<tr>
<td></td>
<td>prepare a poster or talk for an international meeting</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>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.</td>
</tr>
<tr>
<td>Reader’s advisory</td>
<td>dependent on the scientific topic</td>
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<tr>
<td>Links</td>
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<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>every semester, flexible</td>
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<tr>
<td>Module capacity</td>
<td>unlimited (please contact module organizer individually)</td>
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<tr>
<td>Modullevel</td>
<td>MM (Mastermodul / Master module)</td>
</tr>
<tr>
<td>Modultar</td>
<td>Wahlpflicht / Elective</td>
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<tr>
<td>Lern-/Lehrform / Type of program</td>
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</tr>
<tr>
<td>Vorkenntnisse / Previous knowledge</td>
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<tr>
<td>Examination</td>
<td></td>
</tr>
<tr>
<td>Time of examination</td>
<td></td>
</tr>
<tr>
<td>Type of examination</td>
<td>none (only pass/fail)</td>
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<tr>
<td>Course type</td>
<td>Seminar</td>
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<tr>
<td>SWS</td>
<td>0.00</td>
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<tr>
<td>Frequency</td>
<td>SuSe and WiSe</td>
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<tr>
<td>Workload attendance</td>
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# Abschlussmodul

**mam - Master´s Thesis Module**

<table>
<thead>
<tr>
<th>Module label</th>
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<td>Module code</td>
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<tr>
<td>Credit points</td>
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<td>Workload</td>
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<td>Used in course of study</td>
<td>Master Biologie &gt; Abschlussmodul</td>
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<td>Contact person</td>
<td>Module responsibility</td>
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<td></td>
<td>Lehrende der Biologie</td>
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<tr>
<td></td>
<td>Authorized examiners</td>
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<tr>
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<td>Lehrende der Biologie</td>
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**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**

<table>
<thead>
<tr>
<th>Languages of instruction</th>
<th>English, German</th>
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<tbody>
<tr>
<td>Duration (semesters)</td>
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<tr>
<td>Module frequency</td>
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<td>Modulart</td>
<td>Pflicht / Mandatory</td>
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**Lern-/Lehrform / Type of program**

**Vorkenntnisse / Previous knowledge**

**Examination**

<table>
<thead>
<tr>
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<th>Time of examination</th>
<th>Type of examination</th>
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<td>Final exam of module</td>
<td>master's thesis (90%)</td>
<td>Final colloquium (10%)</td>
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**Course type**

Seminar

**SWS**

2.00

**Frequency**

SuSe and WiSe

**Workload attendance**

28 h