### Modules for Biology

**Background Modules**

**bio605 - Molecular Genetics and Cell Biology**

<table>
<thead>
<tr>
<th><strong>Module label</strong></th>
<th>Molecular Genetics and Cell Biology</th>
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<tbody>
<tr>
<td><strong>Module code</strong></td>
<td>bio605</td>
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<tr>
<td><strong>Credit points</strong></td>
<td>12.0 KP</td>
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<tr>
<td><strong>Workload</strong></td>
<td>360 h</td>
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</table>

**Used in course of study**
- Master's Programme Biology (Master) > Background Modules
- Master's Programme Biology (Master) > Background Modules
- Master's Programme Neuroscience (Master) > 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**
- BSc (Biologie, Biochemie)

**Skills to be acquired in this module**
- ++ deepened biological expertise
- ++ deepened knowledge of biological working methods
- + data analysis skills
- ++ interdisciplinary thinking
- + critical and analytical thinking
- + independent searching and knowledge of scientific literature
- + data presentation and discussion in German and English (written and spoken)
- + teamwork
- + ethics and professional behaviour
- + project and time management

Addressing students with an emphasis on molecular biology, molecular genetics, cell biology, and neurobiology

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

**Reader's advisory**
- Textbooks of Cell Biology

**Links**
- [http://www.uni-oldenburg.de/humangenetik/](http://www.uni-oldenburg.de/humangenetik/)

**Language of instruction**
- English

**Duration (semesters)**
- 1 Semester

**Module frequency**
- 15

**Reference text**
- associated with bio900

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

**Modulart**
- Wahlpflicht / Elective

**Lern-/Lehrform / Type of program**
- Zellbiologische Grundkenntnisse, Genetik, Biochemie

**Vorkenntnisse / Previous knowledge**
- Zeitbiologische Grundkenntnisse, Genetik, Biochemie

**Examination**
- Time of examination
- Type of examination
- Final exam of module: written examination (70 %), paper(s) presentation 30 %;
<table>
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<tr>
<th>Examination</th>
<th>Time of examination</th>
<th>Type of examination</th>
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<tr>
<td></td>
<td></td>
<td>not graded: signed lab protocols, regular active participation is required for the module to be passed.</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>WiSe</td>
<td>28 h</td>
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<tr>
<td>Seminar</td>
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<td>1.00</td>
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<td>5.00</td>
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<td>70 h</td>
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**Total time of attendance for the module** 112 h
bio655 - Ornithology

<table>
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<tr>
<th>Module label</th>
<th>Ornithology</th>
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<td>Master's Programme Biology (Master) &gt; Background Modules</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

Skills to be acquired in this module
The module imparts advanced knowledge on different aspects of ornithology. The students acquire:

- An extended knowledge of morphological and physiological fundamentals and the resulting ecological and behaviour-biological consequences in birds
- Knowledge, presentation and discussion of relevant English literature from various fields of ornithology
- Deepened biological expertise
- Deepened knowledge of biological working methods
- Critical and analytical thinking
- Independent searching and knowledge of scientific literature
- Data presentation and discussion in German and English (written and spoken)

Module contents

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

Lecture “Ecology and Physiology of Birds”:
This lecture consolidates special aspects of systematics, morphology, physiology, migration, orientation, population biology, communication and behavioural ecology in birds.

Seminar “Current Questions of Ornithology”:
In this seminar, original English publications are presented and discussed which deal with current research results from various fields treated in the lecture. Every student reads a paper on one scientific article and discusses the results of that article with the other participants.

Seminar “Behavioural Ecology of Birds” (option 1):
In the seminar, current literature relating to the life history of birds will be reported. During the term, each participant is presenting an original paper in a short talk and the group of students will be guided to critically discuss the paper.

Seminar “Methods in Field Ornithology” (option 2):
The core methods of field ornithology, such as stable isotopes, bird census, ringing, radar, radio tracking, etc., will be introduced with the help of English scientific papers by the students. In the presentations the corresponding methods will be explained in detail with an emphasis on the pros and cons of the method. The aim of this seminar is to learn how to deal with scientific methods in a critical way.

Reader's advisory


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

Languages of instruction
German, English

Duration (semesters)
1 Semester

Module frequency

Module capacity
30

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
Klausur in der letzten Vorlesungswoche
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.

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

Total time of attendance for the module
112 h
**bio675 - Molecular Ecology**

<table>
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<th>Module label</th>
<th>Molecular Ecology</th>
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<tr>
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<td>Workload</td>
<td>360 h</td>
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<td>Master's Programme Biology (Master) &gt; Background Modules</td>
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<td></td>
<td>Master's Programme Biology (Master) &gt; Background Modules</td>
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</table>

**Contact person**

- Module responsibility
  - Arne Nolte
- Authorized examiners
  - Arne Nolte
  - Gabriele Gerlach
- Module counseling
  - Gabriele Gerlach

**Entry requirements**

- B.Sc. (Biologie, Umweltwissenschaften)
- M.Sc. (Biologie, Marine Umweltwissenschaften, Landschaftsökologie)

**Skills to be acquired in this module**

- The field of molecular ecology strives to identify relationships between species genotypes, phenotypes and ecological factors. It addresses questions about how organisms adapt and explains patterns of distribution and biodiversity. During the course, participants will get to know the biological background to design an experiment in the field of molecular ecology. We will discuss the state of the art according to literature. Participants will perform sampling and conduct steps of the analysis. The course will cover field methods (sampling) and lab methods (behavior experiments, genetic analyses, phenotypic analyses) as well as computer based analyses.

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

**Module contents**

- Lecture: AN/GG - Molecular ecology background of specific study systems. The lectures will introduce a study system that will be analyzed during the course (study systems may vary from year to year). It is the goal of the lecture to provide students with background information to develop an experimental design of a field study during the practical.
- Exercise: AN/GG - Mixed course with laboratory and field exercises. Samples will be collected in the field. One goal of the course is to apply modern analyses to understand how organisms are distributed. Another aspect is the application of molecular markers to analyze behavioral experiments.

**Reader’s advisory**

- will be announced during the course

**Links**

<table>
<thead>
<tr>
<th>Languages of instruction</th>
<th>German, English</th>
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<tbody>
<tr>
<td>Duration (semesters)</td>
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<tr>
<td>Module frequency</td>
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<tr>
<td>Module capacity</td>
<td>15</td>
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<tr>
<td>Reference text</td>
<td>associated with bio890 Current Topics of Biology (Seminar)</td>
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<tr>
<td>Modullevel</td>
<td>MM (Mastermodul / Master module)</td>
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<td>Modulart</td>
<td>Wahlpflicht / Elective</td>
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**Lern-/Lehrform / Type of program**


**Examination**

<table>
<thead>
<tr>
<th>Final exam of module</th>
<th>Time of examination</th>
<th>Type of examination</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>during the module</td>
<td>Präsentationen (50%), Portfolio (50%), Regular participation is a prerequisite to pass in the module.</td>
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**Course type**

<table>
<thead>
<tr>
<th>Course type</th>
<th>Comment</th>
<th>SWS</th>
<th>Frequency</th>
<th>Workload attendance</th>
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<td>Lecture</td>
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<td>SuSe</td>
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<td>Frequency</td>
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<tr>
<td>Exercises</td>
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<td>6.00</td>
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**Total time of attendance for the module** 112 h
**bio695 - Biochemical concepts in signal transduction**

<table>
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<tr>
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<td>Workload</td>
<td>360 h</td>
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| Used in course of study | Master's Programme Biology (Master) > Background Modules  
|               | Master's Programme Neuroscience (Master) > Background Modules |
| Contact person| Module responsibility  
|               | Karl-Wilhelm Koch  
|               | Authorized examiners  
|               | Karl-Wilhelm Koch  
|               | Alexander Scholten |
|               | Module counseling  
|               | Alexander Scholten |
| Entry requirements | keine |
| 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  
|                                          | + project and time management |
| Module contents | Lecture: Molecular fundamentals of cellular signal processes  
|                  | Seminar: Signal transduction  
|                  | Exercises: Experiments on cellular signal transduction and enzymology  
|                  | Mechanisms of biochemical signal transduction are imparted theoretically and experimentally |
| Reader's advisory | Textbooks of cell biology and biochemistry. Current literature on topics of signal transduction (as announced in the preparatory meeting). |
| Links |  |
| Language of instruction | English |
| Duration (semesters) | 1 Semester |
| Module frequency |  |
| Module capacity | 20 |
| Modullevel | MM (Mastermodul / Master module) |
| Modular | Wahlpflicht / Elective |

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

| Vorkenntnisse / Previous knowledge |  |
|------------------------------------|  |
| Examination | Time of examination | Type of examination |
| Final exam of module | 90 minutes written exam | written examination (50%) protocols (50%) |

<table>
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<th>Course type</th>
<th>Comment</th>
<th>SWS</th>
<th>Frequency</th>
<th>Workload attendance</th>
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<td>Lecture</td>
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<td>1.00</td>
<td>WiSe</td>
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<tr>
<td>Seminar</td>
<td></td>
<td>1.00</td>
<td>WiSe</td>
<td>14 h</td>
</tr>
<tr>
<td>Exercises</td>
<td></td>
<td>6.00</td>
<td>WiSe</td>
<td>84 h</td>
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**Total time of attendance for the module**

112 h
bio703 - Basic Concepts in Plant Sciences

Module label | Basic Concepts in Plant Sciences
---|---
Module code | bio703
Credit points | 12.0 KP
Workload | 360 h

Used in course of study:
- Master's Programme Biology (Master) > Background Modules

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 [nop]
++ 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 [nop]

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

Reader's advisory

Links
Language of instruction
- German, English

Duration (semesters)
1 Semester

Module frequency

Module capacity
12

Reference text
associated with bio765 (Current Methods in Plant Science) (recommended)

Modulelevel
MM (Mastermodul / Master module)

Modulart
Wahlpflicht / Elective

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

Vorkenntnisse / Previous knowledge
- Ökologie, Flora, Genetik

Examination
Time of examination
Type of examination

Final exam of module
1 Portfolio

Course type | Comment | SWS | Frequency | Workload attendance
---|---|---|---|---
Lecture | | 4.00 | WiSe | 56 h
Seminar | | 4.00 | WiSe | 56 h

Total time of attendance for the module | 112 h
**bio720 - Marine Biodiversity**

**Module label**: Marine Biodiversity  
**Module code**: bio720  
**Credit points**: 15.0 KP  
**Workload**: 450 h  
**Used in course of study**  
- Master's Programme Biology (Master) > Background Modules  
- Master's Programme Biology (Master) > Background Modules

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

**Entry requirements**: BSc (Biology)

**Skills to be acquired in this module**:  
- ++ deepened biological expertise  
- ++ deepened knowledge of biological working methods  
- ++ data analysis skills  
- ++ interdisciplinary thinking  
- ++ critical and analytical thinking  
- ++ independent searching and knowledge of scientific literature  
- ++ ability to perform independent biological research  
- ++ data presentation and discussion in German and English (written and spoken)  
- ++ teamwork  
- ++ ethics and professional behaviour  
- ++ project and time management  
- ++ statistics & scientific programming  

**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 seamounts; (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
- Module level: MM (Mastermodul / Master module)
- Modulart: Wahlpflicht / Elective
- Lern-/Lehrform / Type of program: je nach Studiengang Pflicht oder Wahlpflicht

**Vorkenntnisse / Previous knowledge**

**Examination**  
- Time of examination:  
- Type of examination: Written examination (60 %), portfolio (20 %), short presentation (20 %)
- Regular active participation is required for the module to be passed.

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<tr>
<th>Course type</th>
<th>Comment</th>
<th>SWS</th>
<th>Frequency</th>
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<td>9.00</td>
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**Total time of attendance for the module**: 182 h
### bio733 - Evolutionary Biology Population Genetics

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<tr>
<td>Credit points</td>
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<td>Workload</td>
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<tr>
<td>Contact person</td>
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<td></td>
<td>Module responsibility</td>
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<tr>
<td></td>
<td>Gabriele Gerlach</td>
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<tr>
<td>Authorized examiners</td>
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<td>Gabriele Gerlach</td>
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<td>Dirk Carl Albach</td>
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<td>Entry requirements</td>
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<td>Skills to be acquired in this module</td>
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<tr>
<td></td>
<td>+ vertiefte biologische Fachkenntnisse</td>
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<td></td>
<td>++ vertiefte Kenntnisse biologischer Arbeitstechniken</td>
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<tr>
<td></td>
<td>++ Fähigkeit zur Datenanalyse; ++ kritisches und analytisches Denken</td>
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<td>++ eigenständige Recherche und Kenntnisse wissenschaftlicher Primärliteratur</td>
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<tr>
<td></td>
<td>++ Datenpräsentation und Diskussion in Wort und Schrift (D/E)</td>
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<tr>
<td></td>
<td>+ Teamfähigkeit</td>
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<tr>
<td></td>
<td>++ Statistik und wissenschaftliches Programmieren</td>
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<tr>
<td></td>
<td>Übung: Es werden Datensätze und Methoden vorgestellt und angewendet, um die Verbreitung und genetischen Austausch zwischen Populationen zu bestimmen.</td>
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<tr>
<td>Reader’s advisory</td>
<td>aktuelle wissenschaftliche Artikel zur Evolutionsbiologie</td>
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<tr>
<td></td>
<td>Futuyama D. Evolutionary Biology, Elsevier, Hartl &amp; Clark Priciples of Population Genetics, Sinauer</td>
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<tr>
<td>Reference text</td>
<td>associated with bio736 (Evolutionary Transcriptomics) (recommended)</td>
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<td>MM (Mastermodul / Master module)</td>
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<td>Wahlpflicht / Elective</td>
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<td>Vorkenntnisse / Previous knowledge</td>
<td>Grundkenntnisse Evolutionsbiologie</td>
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<td>Time of examination</td>
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<td>Final exam of module</td>
<td>portfolio (60%) presentation (40%)</td>
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bio736 - Evolutionary Transcriptomics

Module label: Evolutionary Transcriptomics
Module code: bio736
Credit points: 6.0 KP
Workload: 180 h

Used in course of study:
- Master's Programme Biology (Master) > Background Modules
- Master's Programme Biology (Master) > 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:
- Module capacity: 12

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

Module level:
- MM (Mastermodul / Master module)

Lern-Lehrform / Type of program:
- Grundkenntnisse Evolutionsbiologie

Examination:
- Time of examination: portfolio (60%) presentation (40%)

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

Total time of attendance for the module: 56 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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</thead>
<tbody>
<tr>
<td>Module code</td>
<td>bio765</td>
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<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's Programme Biology (Master) > Background Modules  
• Master's Programme Biology (Master) > Background Modules |
| 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**
- Wahlpflicht / Elective

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

**Vorkenntnisse / Previous knowledge**
- Ökologie, Flora, Genetik

**Examination**
- Time of examination
- Type of examination

**Final exam of module**
- Portfolio

**Course type**
- Exercises

**SWS**
- 8.00

**Frequency**
- WiSe

**Workload attendance**
- 112 h
**Module label**: Field Methods in Organismal Biology

**Module code**: bio770

**Credit points**: 15.0 KP

**Workload**: 450 h

**Used in course of study**
- Master's Programme Biology (Master) > Background Modules
- Master's Programme Biology (Master) > Background Modules

**Contact person**
- Module responsibility: Gerhard Wolfgang Zotz
- Authorized examiners: Gerhard Wolfgang Zotz, Gabriele Gerlach, Dirk Carl Albach, Thomas Glatzel, Klaus Bernhard von Hagen, Henrik Mouritsen
- Module counseling: Gabriele Gerlach, Dirk Carl Albach, Thomas Glatzel, Klaus Bernhard von Hagen, Henrik Mouritsen

**Entry requirements**
- Skills to be acquired in this module:
  - ++ deepened biological expertise
  - ++ deepened knowledge of biological working methods
  - ++ data analysis skills
  - + interdisciplinary thinking
  - ++ critical and analytical thinking
  - ++ independent searching and knowledge of scientific literature
  - + ability to perform independent biological research
  - + data presentation and discussion in German and English (written and spoken)
  - + project and time management
  - + statistics & scientific programming
- The molecule aims at enabling students to apply theoretical knowledge to practical, hypothesis-based field studies within the scope of a seminar. The data derived from the individual projects performed are then to be documented and discussed in the form of a written laboratory course report oriented by a scientific publication and to be written in English. Several teachers cooperate to enable interdisciplinary approaches (e.g. botanical-zoological approaches).

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

**Reader's advisory**
- Varies with topic and field locality

**Links**
- www.uni-oldenburg.de/fun_eco/

**Languages of instruction**
- German, English

**Duration (semesters)**
- 1 Semester

**Module frequency**
- jährlich

**Module capacity**
- 21

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

**Modulart**
- Wahlpflicht / Elective

**Modulart**
- je nach Studiengang Pflicht oder Wahlpflicht

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

**Examination**
- Time of examination: 2 Presentations (30 %) Laboratory course report on project work (70 %)

<table>
<thead>
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<th>Frequency</th>
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<td>28 h</td>
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<td>0.00</td>
<td>WiSe</td>
<td>0 h</td>
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<td>Comment</td>
<td>SWS</td>
<td>Frequency</td>
<td>Workload attendance</td>
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<td></td>
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<td>168 h</td>
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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's Programme Biology (Master) > Background Modules
- Master's Programme Biology (Master) > 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 floristic 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
- Biodiversity of littoral biotic communities
- Topographical field research

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
- 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
- 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.

HEMPBEL, G., HEMPHEL, I., & S. SCHIEL (HRSG.), 2006: Faszination Meeresforschung – Ein biologisches Lesebuch. Hauschild Verlag. % This textbook is information and fun for all readers interested in marine life as well as in the protection of marine environments.

HOFRICHTER, R., 2001: Das Mittelmeer - Fauna, Flora, Ökologie. Spektrum Akademischer Verlag, Heidelberg - Berlin: Band I, II, III. % The textbook for the Mediterranean Sea! The general 1st part provides valuable information on symbioses or feeding types, for example.


NYBAKEN, J. W. & M. D. MERTNESS, 2005: Marine Biology - An ecological approach. Pearson, Education paperback book. Addison, Wesley, Publishers. % Highly illustrative! Much additional information on different fields! The authors provide a unique ecological approach that helps students understand the real-world relevance of marine biology by exploring how organisms interact within their individual ecosystems.


Science Citation Index, Zoological Record http://www.biodiversitylibrary.org/bibliography/14107

Language of instruction: German
Duration (semesters): 1 Semester
Module frequency: jährlich
Module capacity: unlimited
Module level: MM (Mastermodul / Master module)
Module level: ---
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<th>Workload attendance</th>
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<td>126 h</td>
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<td>42 h</td>
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<td>Seminar (Pflichtveranstaltung für Erstsemester OHNE bisherige Belehrung)</td>
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<td>0.00</td>
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<td>0 h</td>
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**Total time of attendance for the module**: 168 h
bio845 - Introduction to Development and Evolution

<table>
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<tr>
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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>
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<tr>
<td>Workload</td>
<td>180 h</td>
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**Used in course of study**
- Master's Programme Biology (Master) > Background Modules
- Master's Programme Biology (Master) > Background Modules
- Master's Programme Neuroscience (Master) > Background Modules

**Contact person**

- **Module responsibility**
  - Ulrike Sienknecht

- **Authorized examiners**
  - Ulrike Sienknecht
  - Maike Claußen
  - Lena Ebbers

- **Module counseling**
  - Maike Claußen

**Entry requirements**

**Skills to be acquired in this module**

Upon successful completion of this course, students will:
- 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
Reference text: associated with bio846 (previously neu120) (Lab Exercises in Development and Evolution)

Modullevel: MM (Mastermodul / Master module)

Modulart: Wahlpflicht / Elective

Lern-/Lehrform / Type of program
organismic biology, developmental biology, evolutionary biology, neurobiology, genetics, molecular biology

Vorkenntnisse / Previous knowledge
organismic biology, developmental biology, evolutionary biology, neurobiology, genetics, molecular biology

Examination
Time of examination: same winter term
Type of examination: oral exam of 30 minutes

Final exam of module

<table>
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<tr>
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<th>Comment</th>
<th>SWS</th>
<th>Frequency</th>
<th>Workload attendance</th>
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<tr>
<td>Lecture</td>
<td></td>
<td>2.00</td>
<td>WiSe</td>
<td>28 h</td>
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<td></td>
<td>2.00</td>
<td>WiSe</td>
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Total time of attendance for the module: 56 h
bio846 - Lab Exercises in Development and Evolution

Module label: Lab Exercises in Development and Evolution

Module code: bio846

Credit points: 6.0 KP

Workload: 180 h

Used in course of study:
- Master's Programme Biology (Master) > Background Modules
- Master's Programme Biology (Master) > Background Modules
- Master's Programme Neuroscience (Master) > Background Modules

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

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 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:
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

Module capacity: 6 (selection criteria: sequence of registration)

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

Examination:
- Time of examination
- Type of examination

Final exam of module:
- same winter term
- 1 portfolio

Course type:
- Lecture
- Comment: SWS
- Frequency: WiSe
- Workload attendance: 7 h
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<th>Frequency</th>
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**Total time of attendance for the module**

56 h
### bio860 - Comparative Developmental Biology

<table>
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<th>Comparative Developmental Biology</th>
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<tr>
<td>Module code</td>
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<tr>
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<td>6.0 KP</td>
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<tr>
<td>Workload</td>
<td>180 h</td>
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</table>
| Used in course of study | • Master's Programme Biology (Master) > Background Modules  
                          • Master's Programme Biology (Master) > Background Modules |
| Contact person       | Module responsibility                                   |
|                      | • Ulrike Sienknecht                                    |
|                      | Authorized examiners                                   |
|                      | • Ulrike Sienknecht                                    |
|                      | Module counseling                                      |
|                      | • N. N.                                                |
| Entry requirements   | [nop] ++ deepened biological knowledge ++ deepened knowledge of techniques in biology ++ knowledge in data analysis and presentation + cross-disciplinary knowledge and thinking ++ critical and analytical thinking + independent searching and knowledge of scientific literature ++ ability to perform independent biological research ++ data presentation and discussion in German and English (written and spoken) + team work + ethics and professional behaviour ++ project and time management [/nop] |
| Skills to be acquired in this module | 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. |
| Language of instruction | English                                              |
| Duration (semesters) | 1 Semester                                             |
| Module frequency     |                                                       |
| Module capacity      | 6 (Reihenfolge der Anmeldungen)                       |
| Reference text       | associated with bio845 Introduction to Development and Evolution |
| Modullevel           | MM (Mastermodul / Master module)                      |
| Modulart             | Wahlpflicht / Elective                                |
| Lern-/Lehrform / Type of program | je nach Studiengang Pflicht oder Wahlpflicht         |
| Vorkenntnisse / Previous knowledge | organismic biology, experience with lab work |
| Examination          | Time of examination                                   |
| Final exam of module | same summer term                                      |
| Comment              | 1 portfolio                                            |
| Course type          | SWS Frequency Workload attendance                     |
| Lecture              | 1.00 SuSe 14 h                                        |
| Exercises            | 3.00 SuSe 42 h                                        |
| Total time of attendance for the module | 56 h |
neu141 - Visual Neuroscience - Physiology and Anatomy

<table>
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<tr>
<th>Module label</th>
<th>Visual Neuroscience - Physiology and Anatomy</th>
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<tbody>
<tr>
<td>Module code</td>
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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></td>
<td>(3 SWS Lecture (VO) Total workload 90 h: 30h contact / 60h background literature reading and preparation for sh 1 SWS Seminar (SE) Total workload 30h: 10h contact / 20h literature reading and preparation of result presentation 8 SWS Supervised excercise (UE) Total workload 240h: 200h contact / 40h results analysis, writing of short reports for portfolio)</td>
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<td></td>
<td>Master's Programme Biology (Master) &gt; Background Modules</td>
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<tr>
<td></td>
<td>Master's Programme Neuroscience (Master) &gt; Background Modules</td>
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<tr>
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<td>Module responsibility</td>
</tr>
<tr>
<td></td>
<td>- Martin Greschner</td>
</tr>
<tr>
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<tr>
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<td>- Martin Greschner</td>
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<td>- Karin Dedek</td>
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<td>- Ulrike Janssen-Bienhold</td>
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<td></td>
<td>- Christian Puller</td>
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<tr>
<td>Entry requirements</td>
<td>Basic knowledge of neurobiology</td>
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<tr>
<td>Skills to be acquired in this module</td>
<td>++ Neurosci. knowlg.</td>
</tr>
<tr>
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<td>++ Expt. Methods</td>
</tr>
<tr>
<td></td>
<td>+ Independent research</td>
</tr>
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<td>++ Scient. Literature</td>
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<tr>
<td></td>
<td>+ Social skills</td>
</tr>
<tr>
<td></td>
<td>+ Maths/Stats/Progr.</td>
</tr>
<tr>
<td></td>
<td>++ Data present/disc.</td>
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<td></td>
<td>+ Scientific English</td>
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<td></td>
<td>+ Ethics</td>
</tr>
</tbody>
</table>

Upon successful completion of this course, students

- have basic knowledge of electrophysiological techniques used in neuroscience research
- have acquired first practical skills in some electrophysiological techniques
- have acquired basic skills in data analysis
- have knowledge on retinal physiology and anatomy of the visual system
- have basic knowledge of brain structures and their function
- have profound knowledge of the architecture and circuits of the vertebrate retina
- have acquired basic skills in histological techniques (tissue fixation, embedding, sectioning, staining procedures, immunohistochemistry)
- have acquired fundamental skills in microscopy (differential interference contrast microscopy, phase-contrast microscopy, confocal microscopy)

Module contents

The background module Neurophysiology consists of two weeks of theoretical introduction and two weeks of hands-on lab exercises in patch or extracellular recordings and two weeks of hands-on lab exercises in anatomy.

The seminars cover the following topics:

- Visual system
- Introduction to electrophysiological methods
- Introduction into methods used in neuranatomy and neurochemistry
- Introduction into microscopy and image analysis
- Presentation and discussion of results relating to the literature

Reader's advisory

Course scripts and mandatory scientific literature discussed in the seminar will be available in Stud.IP. Background and seminar literature will be available in Stud.IP.

Links

Language of instruction | English
Duration (semesters) | 1 Semester
Module frequency | annually, summer term, first half (full time)
Module capacity | 12 - with Visual Neuroscience: Anatomy
Shared course components with (cannot be credited twice):
neu151 BM Visual Neuroscience: Anatomy

<table>
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<th>MM (Mastermodul / Master module)</th>
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<tr>
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<td>Wahlpflicht / Elective</td>
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<tr>
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<th>Wahlpflicht / Elective</th>
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<table>
<thead>
<tr>
<th>Vorkenntnisse / Previous knowledge</th>
<th>Basic knowledge in neurobiology</th>
</tr>
</thead>
</table>

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

<table>
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<tr>
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<th>Comment</th>
<th>SWS</th>
<th>Frequency</th>
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<tr>
<td>Lecture</td>
<td></td>
<td>2.00</td>
<td>SuSe or WiSe</td>
<td>28 h</td>
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<tr>
<td>Seminar</td>
<td></td>
<td>2.00</td>
<td>SuSe or WiSe</td>
<td>28 h</td>
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<tr>
<td>Exercises</td>
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<td>2.00</td>
<td>SuSe or WiSe</td>
<td>28 h</td>
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<th>84 h</th>
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</table>
neu150 - Neuroanatomy

<table>
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<tr>
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<tr>
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<td>Credit points</td>
<td>6.0 KP</td>
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<tr>
<td>Workload</td>
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</table>

**Used in course of study**
- Master's Programme Biology (Master) > Background Modules
- Master's Programme Biology (Master) > Background Modules
- Master's Programme Neuroscience (Master) > 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

**Skills to be acquired in this module**
- Neurosci. knowlg. Expt. methods Independent research + Scient. literature + Social skills
- Interdiscipl. knowlg. Maths/Stats/Progr. + Data present./disc. + Scientific English Ethics
- Theory: Improved theoretical and methodological knowledge in neurobiology. Discussion of scientific work and presentation of own results.
- Practice: Performing neuroanatomical experiments. Gaining modern methodological skills.

**Module contents**
- Lecture: 14 h Introduction to current neurobiological approaches and results.
- Seminar: 14 h Discussion of background literature and results of own experiments.
- Lab course: 3 weeks, each 24 h neuroanatomical experiments in small groups on vertebrate retina and brain.

**Reader's advisory**
- Background and seminar literature will be available in Stud.IP

**Links**
- Language of instruction: English
- Duration (semesters): 1 Semester
- Module frequency: jährlich
- Module capacity: unlimited
- Reference text:
  - Course in the first half of the semester
  - Regular active participation and presentation(s) within the scope of the seminar are required to pass the module

**Modullevel**
- BC (Basiscurriculum / Base curriculum)

**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>
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<tr>
<td>Final exam of module</td>
<td>summer semester, first half</td>
<td>Portfolio (75 %), report (25%)</td>
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<th>Frequency</th>
<th>Workload attendance</th>
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<td>14 h</td>
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<tr>
<td>Practical</td>
<td></td>
<td>3.00</td>
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<td>42 h</td>
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**Total time of attendance for the module**
- 70 h
neu210 - Neurosensory Science and Behaviour - Part A

Module label
Neurosensory Science and Behaviour - Part A

Module code
neu210

Credit points
9.0 KP

Workload
270 h
(4 SWS Lecture (VO) "Neuroethology" and "Behavioural ecology" Total workload 180h: 56h contact/ 60h background reading/ 64h exam preparation 2 SWS Seminar (SE) "Current issues of ethology" Total workload 90h: 28h contact/ 30h literature reading/ 32h preparation of presentation)

Used in course of study
- Master's Programme Biology (Master) > Background Modules
- Master's Programme Biology (Master) > Background Modules
- Master's Programme Neuroscience (Master) > 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
Fundamentals of Neurobiology, Behavioural Biology, Evolution, Ecology

Skills to be acquired in this module

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

Recommended in combination with: neu220 BM "Neurocognition and Psychopharmacology" Shared course components with (cannot be credited twice): bio610 (5.02.611 "Neuroethologie", 5.02.612 "Verhaltensökologie", 5.02.613 "Aktuelle Themen der Ethologie")

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

Modullevel
---

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

Vorkenntnisse / Previous knowledge
Fundamentals of Neurobiology, Behavioural Biology, Evolution, Ecology
<table>
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<tr>
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<th>Type of examination</th>
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<td>Final exam of module</td>
<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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<th>SWS</th>
<th>Frequency</th>
<th>Workload attendance</th>
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<tr>
<td>Lecture</td>
<td></td>
<td>4.00</td>
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<td>56 h</td>
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<tr>
<td>Seminar</td>
<td></td>
<td>2.00</td>
<td></td>
<td>28 h</td>
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**Total time of attendance for the module**: 84 h
neu220 - Neurosensory Science and Behaviour - Part B

Module label
Neurosensory Science and Behaviour - Part B

Module code
neu220

Credit points
6.0 KP

Workload
180 h
(3 SWS Lecture (VO) "Introd. to Cognitive Neuroscience" and "Psychopharmacol." Total workload 135h: 45h contact/ 45 background reading/ 45h exam preparation 1 SWS Supervised exercise (UE) Total workload 45h: 14h contact/ 31h paper reading)

Used in course of study
- Master's Programme Biology (Master) > Background Modules
- Master's Programme Biology (Master) > Background Modules
- Master's Programme Neuroscience (Master) > Background Modules

Contact person
Module responsibility
- Christiane Margarete Thiel

Authorized examiners
- Carsten Gießing
- Christiane Margarete Thiel

Module counseling
- Carsten Gießing

Entry requirements

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

Upon successful completion of this course, students
- know the fundamentals of neurotransmission
- know the basic neural mechanisms underlying attention, learning, emotion, language and executive functions
- understand the relationship between disturbances in neurotransmitter systems, cognitive functions and psychiatric disease
- know the principles of drug treatment for psychiatric disorders
- have in-depth knowledge in selected areas of these topics
- are able to understand, explain and critically assess neuroscientific approaches in animals and humans

are able to understand and critically assess published work in the area of cognitive neuroscience

Module contents
The lecture "Introduction to Cognitive Neuroscience" gives a short introduction into neuroanatomy and cognitive neuroscience methods and then covers different cognitive functions.

Lecture topics:
- History of cognitive neuroscience
- Methods of cognitive neuroscience
- Attention
- Learning
- Emotion
- Language
- Executive functions.

The supervised exercises either deepen 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
<table>
<thead>
<tr>
<th><strong>Duration (semesters)</strong></th>
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<td><strong>Module frequency</strong></td>
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<td><strong>Module capacity</strong></td>
<td>30 (Recommended in combination with neu210 &quot;Neurosensory Science and Behaviour&quot;, neu300 &quot;Functional MRI data analysis&quot; Shared course components with (cannot be credited twice): bio610 and psy181 (5.02.614 &quot;Introduction to Cognitive Neuroscience&quot;, 5.02.515 &quot;Psychopharmacology&quot;) )</td>
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<td><strong>Reference text</strong></td>
<td>Course in the second half of the semester Regular active participation is required to pass the module.</td>
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<td><strong>Modullevel</strong></td>
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<td><strong>Modulart</strong></td>
<td>je nach Studiengang Pflicht oder Wahlpflicht</td>
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<td><strong>Lern-Lehrform / Type of program</strong></td>
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<td><strong>Vorkenntnisse / Previous knowledge</strong></td>
<td>Fundamentals of Neurobiology, Behavioural Biology</td>
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<td><strong>Examination</strong></td>
<td><strong>Time of examination</strong></td>
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<td>as agreed, usually in the break after the winter term</td>
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<td><strong>Course type</strong></td>
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<td><strong>Total time of attendance for the module</strong></td>
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neu290 - Biophysics of Sensory Reception

Module label: Biophysics of Sensory Reception
Module code: neu290
Credit points: 6.0 KP
Workload: 180 h

Used in course of study:
- Master's Programme Biology (Master) > Background Modules
- Master's Programme Biology (Master) > Background Modules
- Master's Programme Neuroscience (Master) > Background Modules

Contact person:
Module responsibility: Michael Winklhofer
Authorized examiners:
- Michael Winklhofer

Entry requirements:
Recommended previous knowledge/skills: cell biology of neurons

Skills to be acquired in this module:
++ Neurosci. knowlg.
+ Independent research
+ Scient. Literature
++ Interdiscipl. knowlg.
+ Data present./disc.

- to gain a general understanding of sensory reception
- to acquire specific knowledge of sensory reception at the molecular and cellular level,

with focus on the relationship between structure and function of sensory molecules

- to be able to perform simple quantitative assessments of detection sensitivity to physical stimuli
- to understand common features in transduction pathways among various senses

Module contents:

Reader's advisory:
Required reading:
The reading list will be updated on an annual basis to include new developments. The current reading list can be found on StudIP.

Recommended textbook(s) or other literature:

Links:

Language of instruction: English
Duration (semesters): 1 Semester
Module frequency: annually, summer term, second half
Module capacity: 20
Modullevel: MM (Mastermodul / Master module)
Modulart: Wahlpflicht / Elective
<table>
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<th>Modulart</th>
<th>je nach Studiengang Pflicht oder Wahlpflicht</th>
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</thead>
<tbody>
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<td>Lern-/Lehrform / Type of program</td>
<td></td>
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<tr>
<td>Vorkenntnisse / Previous knowledge</td>
<td>cell biology of neurons</td>
</tr>
<tr>
<td>Vorkenntnisse / Previous knowledge</td>
<td>cell biology of neurons</td>
</tr>
<tr>
<td>Examination</td>
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<th>Workload attendance</th>
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<td>Lecture</td>
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<td>2.00</td>
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<td>Seminar</td>
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<td>2.00</td>
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**Total time of attendance for the module**  
56 h
neu300 - Functional MRI data analysis

Module label | Functional MRI data analysis
Module code | neu300
Credit points | 12.0 KP
Workload | 360 h
- 3 SWS Practical (PR) Total workload 225h: 70h contact / 100h experimental work / 55h exam preparation
- 2 SWS Lecture (VO) Total workload 90h: 28h contact / 30h background reading / 32h exam preparation
- 1 SWS Seminar (SE) Total workload 45h: 15h contact / 30h preparation of presentation

Used in course of study
- Master's Programme Biology (Master) > Background Modules
- Master's Programme Biology (Master) > Background Modules
- Master's Programme Neuroscience (Master) > Background Modules

Contact person
Module responsibility
- Carsten Gießing
Authorized examiners
- Carsten Gießing
- Christiane Margarete Thiel

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

Students will learn the basics about planning and performing a neuroimaging study. They will focus on the statistical and methodological background of functional neuroimaging data analysis and analyse a sample functional MRI data set.

Module contents
The modul comprises (i) a lecture “Functional MRI data analysis” [2 SWS], and (ii) a practical course [5 SWS] and (iii) a seminar “Experiments on Neurocognition” [1 SWS] including aspects of planning, performance and analysis of functional neuro-imaging studies using MATLAB based software.

Reader's advisory

Links

Language of instruction | English
Duration (semesters) | 1 Semester
Module frequency | annually, summer term, second half
Module capacity | 12 (in total with bio640) (shared course components with (cannot be credited twice): bio640)

Modullevel | MM (Mastermodul / Master module)

Lern-Lehrform / Type of program
Wahlpflicht / Elective
je nach Studiengang Pflicht oder Wahlpflicht

Vorkenntnisse / Previous knowledge

Examination | Time of examination | Type of examination
Final exam of module | end of summer term | 70% oral exam or written exam, 30% presentations in addition, mandatory but ungraded. Regular active participation

Course type | Comment | SWS | Frequency | Workload attendance
Practical | | 5.00 | SuSe | 70 h
Seminar | | 1.00 | SuSe | 14 h
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<th>Frequency</th>
<th>Workload attendance</th>
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<tr>
<td>Lecture</td>
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<td>28 h</td>
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**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
- 5 SWS Practical (PR) "Experiments in Hearing" Total workload 225h: 70h contact / 110h experimental work / 45h exam preparation
- 1 SWS Supervised exercise (UE) "Fundamentals in psychoacoustic data analysis" Total workload 45h: 15h contact / 30h practising data analysis (incl. SPSS)
- 2 SWS Seminar (SE) "Hearing" Total workload 90h: 30h contact / 60h background reading

Used in course of study:
- Master's Programme Biology (Master) > Background Modules
- Master's Programme Biology (Master) > Background Modules
- Master's Programme Neuroscience (Master) > 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:
- + Neurosci. knowlg.
- ++ Exp. Methods
- + Social skills
- ++ Maths/Stats/Progr.
- + Data present./disc.
- + Scientific English

Students will learn the basics about performing a psychoacoustic experiment. Based on an experiment in which they study their own hearing, they will learn how to conduct a behavioural study in hearing and analyze the data. In addition, they will be provided with an overview of the mechanisms of auditory perception.

Module contents:
The modul comprises (i) a seminar "Hearing" [2 SWS] (ii) an exercise "Fundamentals in psychoacoustic data analysis" [1 SWS], and a (iii) practical course [7 SWS] including aspects of planning and conducting psychoacoustic experiments.

Reader's advisory:
Plack, Christopher J. (2005) The sense of hearing. Mahwah, NJ [u.a.] : Erlbaum (sufficient number of copies available in the university library)

Links:
Language of instruction: English

Duration (semesters): 1 Semester

Module frequency: annually, summer term, second half

Module capacity: 6 (in total with bio640)

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

Modulart:
- Wahlpflicht / Elective

Modulart:
je nach Studiengang Pflicht oder Wahlpflicht

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

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

Course type: Exercises
Comment: 1.00
SWS: 1.00
Frequency: SuSe
Workload attendance: 14 h

Course type: Seminar
Comment: 2.00
SWS: 2.00
Frequency: SuSe
Workload attendance: 28 h

Course type: Practical
Comment: 5.00
SWS: 5.00
Frequency: SuSe
Workload attendance: 70 h

Course type: Lecture
Comment: 0.00
SWS: 0.00
Frequency: SuSe
Workload attendance: 0 h

Total time of attendance for the module: 112 h
neu340 - Invertebrate Neuroscience

<table>
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<tbody>
<tr>
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<tr>
<td>Credit points</td>
<td>6.0 KP</td>
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<tr>
<td>Workload</td>
<td>180 h (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's Programme Biology (Master) > Background Modules  
- Master's Programme Biology (Master) > Background Modules  
- Master's Programme Neuroscience (Master) > Background Modules |
| Contact person     | Module responsibility                                        |
|                    |  › 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                                                     |
| Upon successful completion of this course, students       | • have knowledge on invertebrate neuronal systems in comparison to vertebrate systems |
|                    | • have discussed an overview of experimental and theoretical methods of invertebrate neuroscience |
|                    | • have acquired first practical skills in intracellular recordings from invertebrate neurons |
|                    | • have acquired basic skills in data analysis                |
|                    | • have acquired an intuitive understanding of membrane potential and action potential generation based on computer simulations |
| Module contents    | The background module Neuropysiology consists of three weeks of seminar and hands-on lab exercises on intracellular recordings from leech neurons, as well as computer simulations to study the basis of membrane potential and action potential generation. The seminar covers the following topics: • Invertebrate neuronal systems in comparison to vertebrate systems • Ion channels, membrane potential and action potential generation • Introduction to electrophysiological methods • Introduction to data analysis methods In the practical exercises, portfolio assignments will be performed on: • Qualitative electrophysiological classification of different cell types in the leech nervous system • Quantitative analysis (stimulus - response relationship) of at least one cell type • Action potential generation: Comparison of model simulations and experiments |
| Reader's advisory  | Course scripts and mandatory scientific literature (3 review articles) discussed in the seminar will be available in Stud.IP. Background and seminar literature will be available in Stud.IP |
| Links              |                                                              |
| Language of instruction | English                                                   |
| Duration (semesters) | 1 Semester                                              |
| Module frequency   | annually, summer term, second half                          |
| Module capacity     | 12 (this module provides the background for neu345 “Neural Computation in invertebrate systems”) |
| Modullevel         | MM (Mastermodul / Master module)                           |
| Modulart           | Wahlpflicht / Elective                                      |
| Lern-/Lehrform / Type of program | basic knowledge of neurobiology, basic MATLAB programming skills |
| Vorkenntnisse / Previous knowledge |                                                              |
| Examination        |                                                              |
| Final exam of module | during the course (summer term, second half)  
Portfolio consisting of short tests and short reports  
In addition, mandatory but ungraded: seminar presentation |
<p>| Course type        |                                                              |</p>
<table>
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<th>SWS</th>
<th>Frequency</th>
<th>Workload attendance</th>
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<tbody>
<tr>
<td>Seminar</td>
<td></td>
<td>2.00</td>
<td>SuSe or WiSe</td>
<td>28 h</td>
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<tr>
<td>Exercises</td>
<td></td>
<td>2.00</td>
<td>SuSe or WiSe</td>
<td>28 h</td>
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</table>

**Total time of attendance for the module**

56 h
neu360 - Auditory Neuroscience

Module label: Auditory Neuroscience
Module code: neu360
Credit points: 6.0 KP

Workload:
- 1 SWS Lecture (VO) Total workload 45h: 14 h contact / 31 h background reading
- 1 SWS Seminar (SE) Total workload 45h: 14 h contact / 15 h background reading / 16 h preparation and presentation
- 2 SWS Supervised exercise (UE) Total workload 90h: 10 h contact / 20 h literature search / 60 h work on essay paper

Used in course of study:
- Master's Programme Biology (Master) > Background Modules
- Master's Programme Neuroscience (Master) > Background Modules

Contact person:
Module responsibility
- Christine Köppl

Authorized examiners:
- Georg Martin Klump
- Christine Köppl

Entry requirements:
Recommended previous knowledge/skills: Basics of Neurosensory Science and Behavioural Biology

Skills to be acquired in this module:
++ Neurosci. knowlg.
+ Expt. Methods
++ Scient. Literature
+ Social skills
++ Interdiscipl. knowlg.
+ Data present./disc.
++ Scientific English
+ Ethics

Module contents:
One week introductory block course, comprised of a lecture series and matching seminar that emphasizes discussion.
Topics:
- Hair cells: structure, transduction mechanism, receptor potential, synaptic transmission
- Basilar papilla / cochlea: structure, micromechanics, amplification; otoacoustic emissions
- Auditory nerve: phase locking, rate coding, Excitation patterns
- Ascending auditory pathways: wiring, principles of excitation/inhibition, examples of cellular/molecular specialisations
- Sound localisation in birds and mammals
- Central auditory processing: imaging techniques, auditory streams, cortex, primates
- Relation between psychophysics and neurophysiology

The introductory block is followed by a supervised literature search and individually written term paper on a specific topic in auditory neuroscience.

Reader's advisory:
Required reading:
About 20 selected original papers (selection varies)

Recommended textbook(s) or other literature:
Pickles JO (2012) An Introduction to the Physiology of Hearing. Brill, Netherlands

Links:
Language of instruction: English
Duration (semesters): 1 Semester
Module frequency: annually, summer term, second half
Module capacity: 15

Recommended in combination with:
BM neu211 "Neurosensory Science and Behaviour"
or BM neu270 "Neurocognition and Psychophysiology"
or skills module biox "Current Topics in Hearing Science"
<table>
<thead>
<tr>
<th>Modullevel</th>
<th>MM (Mastermodul / Master module)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modulart</td>
<td>Wahlpflicht / Elective</td>
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<tr>
<td>Lern-/Lehrform / Type of program</td>
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<td>Vorkenntnisse / Previous knowledge</td>
<td>Basics of Neurosensory Science and Behavioural Biology</td>
</tr>
<tr>
<td>Examination</td>
<td>Time of examination</td>
</tr>
<tr>
<td>Final exam of module</td>
<td>within a few weeks of the end of summer term lecture period</td>
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<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
## Research Modules

### 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's Programme Biology (Master) &gt; Research Modules</td>
</tr>
<tr>
<td></td>
<td>Master's Programme Biology (Master) &gt; Research Modules</td>
</tr>
<tr>
<td>Contact person</td>
<td></td>
</tr>
<tr>
<td>Module responsibility</td>
<td>Gerhard Wolfgang Zotz</td>
</tr>
<tr>
<td>Authorized examiners</td>
<td>Gerhard Wolfgang Zotz</td>
</tr>
<tr>
<td></td>
<td>Lehrende der Biologie</td>
</tr>
<tr>
<td>Entry requirements</td>
<td>External research projects are done on an individual basis. They are supervised by one person from Oldenburg and a local supervisor at any university or research institution in Germany and abroad. Please contact Gerhard Zotz (<a href="mailto:Gerhard.zotz@uol.de">Gerhard.zotz@uol.de</a>) for details. See <a href="https://uol.de/ibu/studium-und-lehre/fach-master-biology/downloads-und-links/">https://uol.de/ibu/studium-und-lehre/fach-master-biology/downloads-und-links/</a> (Learning Agreement for External Research Module)</td>
</tr>
<tr>
<td>Skills to be acquired in this module</td>
<td>++ deepened biological expertise</td>
</tr>
<tr>
<td></td>
<td>++ deepened knowledge of biological working methods</td>
</tr>
<tr>
<td></td>
<td>++ data analysis skills</td>
</tr>
<tr>
<td></td>
<td>++ critical and analytical thinking</td>
</tr>
<tr>
<td></td>
<td>++ independent searching and knowledge of scientific literature</td>
</tr>
<tr>
<td></td>
<td>++ ability to perform independent biological research</td>
</tr>
<tr>
<td></td>
<td>++ data presentation and discussion in German and English (written and spoken)</td>
</tr>
<tr>
<td></td>
<td>+ teamwork</td>
</tr>
<tr>
<td></td>
<td>++ project and time management</td>
</tr>
<tr>
<td></td>
<td>++ statistics &amp; scientific programming</td>
</tr>
<tr>
<td>Students perform individual research projects to learn:</td>
<td>• planning and organization of a research project in a group outside of University of Oldenburg</td>
</tr>
<tr>
<td></td>
<td>• formulate a scientific hypothesis</td>
</tr>
<tr>
<td></td>
<td>• planning, performing and analyzing experiments and/or simulations</td>
</tr>
<tr>
<td></td>
<td>• working with scientific background literature on the specific context of the project</td>
</tr>
<tr>
<td></td>
<td>• oral presentation and discussion of backgrounds and results in the lab seminar</td>
</tr>
<tr>
<td></td>
<td>• write a scientific report in publication format</td>
</tr>
<tr>
<td></td>
<td>• prepare and present a scientific poster</td>
</tr>
<tr>
<td>Module contents</td>
<td>Students are introduced to independent research in a specific area of biology by a scientific working group outside of the regular IBU Biology faculty at the University of Oldenburg (usually a university research institute in Germany or abroad)</td>
</tr>
<tr>
<td>The content and venue of this module is chosen in close coordination with the Prüfungsausschuss Master Biologie, possibly with consultations of other professors. Course work should cover all parts of a scientific project, i.e. data collection, data analysis and the presentation of the results. Irrespective of the particular venue (universities, research institutes) the student has to report to a professor in Oldenburg in form of a written report and an oral presentation, both in English. Note:</td>
<td>• all members of the regular IBU Biology faculty at the University of Oldenburg can act as local supervisor, students should contact appropriate supervisors individually</td>
</tr>
<tr>
<td></td>
<td>• prior to project start, external and local supervisors must fill the learning agreement form</td>
</tr>
<tr>
<td></td>
<td>• the supervisor at the host institution is invited to submit a short written statement of assessment, final grading is done by the local supervisor</td>
</tr>
<tr>
<td></td>
<td>• participation in a joint poster presentation of concurrent research modules is highly recommended.</td>
</tr>
<tr>
<td>Reader's advisory</td>
<td>varies with chosen topic</td>
</tr>
<tr>
<td>Links</td>
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<td>Duration (semesters)</td>
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</tr>
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<tr>
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<td>Modullevel</td>
<td>MM (Mastermodul / Master module)</td>
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<tr>
<td>Modulart</td>
<td>Wahlpflicht / Elective</td>
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<table>
<thead>
<tr>
<th>Lern-/Lehrform / Type of program</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vorkenntnisse / Previous knowledge</td>
</tr>
</tbody>
</table>

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

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

Module label  Research Module Fast Track
Module code  bio820
Credit points  15.0 KP
Workload  450 h
Used in course of study
- Master's Programme Biology (Master) > Research Modules
- Master's Programme Biology (Master) > Research Modules

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

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

Module contents
Reader's advisory
Links
Languages of instruction  German, English
Duration (semesters)  1 Semester
Module frequency  unregelmäßig
Module capacity  unlimited
Modullevel  ---
Modulart  je nach Studiengang Pflicht oder Wahlpflicht
Lern-/Lehrform / Type of program  internship report

Vorkenntnisse / Previous knowledge

<table>
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<th>Time of examination</th>
<th>Type of examination</th>
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<tbody>
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Course type  Seminar

SWS  0.00

Frequency  --

Workload attendance  0 h
### bio900 - Biology Research Module

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<tr>
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<td>Module code</td>
<td>bio900</td>
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<td>Workload</td>
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<td>Used in course of study</td>
<td>Master's Programme Biology (Master) &gt; Research Modules</td>
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<tr>
<td>Contact person</td>
<td>Module responsibility</td>
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<tr>
<td></td>
<td>Gerhard Wolfgang Zotz</td>
</tr>
<tr>
<td></td>
<td>Authorized examiners</td>
</tr>
<tr>
<td></td>
<td>Gerhard Wolfgang Zotz</td>
</tr>
<tr>
<td></td>
<td>Lehrende der Biologie</td>
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<tr>
<td></td>
<td>Module counseling</td>
</tr>
<tr>
<td></td>
<td>Lehrende der Biologie</td>
</tr>
<tr>
<td>Entry requirements</td>
<td>project and supervisor(s) need to be approved by the exam board prior to the start of lab work</td>
</tr>
</tbody>
</table>

**Hinweise:**
- all members of the regular IBU Biology faculty at the University of Oldenburg can act as local supervisor, students should contact appropriate supervisors individually
- prior to project start, external and local supervisors must fill the learning agreement form
- the supervisor at the host institution is invited to submit a short written statement of assessment, final grading is done by the local supervisor
- participation in a joint poster presentation of concurrent research modules is highly recommended.

### 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

<table>
<thead>
<tr>
<th>Languages of instruction</th>
<th>German, English</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duration (semesters)</td>
<td>1 Semester</td>
</tr>
<tr>
<td>Module frequency</td>
<td>unlimited</td>
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<tr>
<td>Reference text</td>
<td>Within the Modul bio900 is it possible to take several courses as long as their contents differ substantially. When taking the course group 5.02.960 it is mandatory to choose two courses out of the group A – D.</td>
</tr>
<tr>
<td>Modullevel</td>
<td>MM (Mastermodul / Master module)</td>
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<tr>
<td>Modulart</td>
<td>Wahlpflicht / Elective</td>
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### Vorkenntnisse / Previous knowledge

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<th>Examination</th>
<th>Time of examination</th>
<th>Type of examination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Final exam of module</td>
<td>internship report</td>
<td></td>
</tr>
<tr>
<td>Course type</td>
<td>Projektorientiertes Modul</td>
<td></td>
</tr>
<tr>
<td>------------------</td>
<td>---------------------------</td>
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<tr>
<td>SWS</td>
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<td></td>
</tr>
<tr>
<td>Frequency</td>
<td>SuSe and WiSe</td>
<td></td>
</tr>
<tr>
<td>Workload attendance</td>
<td>140 h</td>
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# Skills Modules

**bio870 - Communicating Plant Sciences**

<table>
<thead>
<tr>
<th>Module label</th>
<th>Communicating Plant Sciences</th>
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<tbody>
<tr>
<td>Module code</td>
<td>bio870</td>
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<tr>
<td>Credit points</td>
<td>6.0 KP</td>
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<tr>
<td>Workload</td>
<td>180 h</td>
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</table>

**Used in course of study**

- Master's Programme Biology (Master) > Skills Modules
- Master's Programme Biology (Master) > 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 [nop] + interdisciplinary thinking ++ critical and analytical thinking ++ independent searching and knowledge of scientific literature ++ data presentation and discussion in German and English (written and spoken) [nop]

**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**

**Languages of instruction**

- German, English

**Duration (semesters)**

- 1 Semester

**Module capacity**

- 12

**Module frequency**

- Module

**Moduls**

- W (Wahlfach / Opportunity)

**Module interface**

- je nach studiengang Pflicht oder Wahlpflicht

**Lern-Lehrform / Type of program**

- Ökologie, Flora, Genetik

**Vorkenntnisse / Previous knowledge**

**Examination**

- Time of examination
  - 1 term paper

**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's Programme Biology (Master) > Skills Modules
- Master's Programme Biology (Master) > 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

Skills to be acquired in this module:
- In this module, we provide the skills necessary to describe and distinguish species for floras and monographs/first publication of species. For that, an overview over the plant kingdom is provided. Further, various non-molecular methods of systematics are practiced, such as morphometry, SEM, identification key generation, nomenclature, species delimitation methods, and interpretation of phylogenetic analyses.
  - deepened biological expertise
  - deepened knowledge of biological working methods
  - data analysis skills
  - critical and analytical thinking
  - independent searching and knowledge of scientific literature
  - ability to perform independent biological research
  - data presentation and discussion in German and English (written and spoken)
  - teamwork
  - statistics & scientific programming

Module contents:
- In the seminar we provide an overview over the larger groups of plants and characters for their grouping. We analyse methods for phylogeny generation, angiosperm classification and description of new taxa.
- In the exercises morphological characters are investigated in various ways and internet resources for further morphological characters presented. Species delimitation methods for molecular and morphological characters are used. Identification keys are generated and nomenclatural rules discussed.

Reader’s advisory

Links

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

Module frequency:
- 8

Module capacity:
- 8

Modullevel:
- MM (Mastermodul / Master module)

Modulart:
- Wahlmodul / Opportunity

Lern-/Lehrform / Type of program:

Vorkenntnisse / Previous knowledge:
- gute Kenntnisse der heimischen Flora

Examination:
- Time of examination
- Type of examination

Final exam of module:
- 1 presentation
- 1 report

Course type
- Seminar
- Exercises

Comment
- 2.00

SWS
- WiSe

Frequency
- WiSe

Workload attendance
- 28 h

Total time of attendance for the module: 56 h
**bio890 - Current Topics in Biology**

<table>
<thead>
<tr>
<th>Module label</th>
<th>Current Topics in Biology</th>
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</thead>
<tbody>
<tr>
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<td>bio890</td>
</tr>
<tr>
<td>Credit points</td>
<td>3.0 KP</td>
</tr>
<tr>
<td>Workload</td>
<td>90 h</td>
</tr>
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</table>
| Used in course of study | Master's Programme Biology (Master) > Skills Modules  
                         | Master's Programme Biology (Master) > 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         |
| Module contents       | Discussion and interpretations of one or more themes in modern biology. The themes and exact content will be provided by the instructor(s) at the beginning of the course. |
| Reader's advisory     | Varies with chosen topic (will be provided by the instructor(s) at the beginning of the course) |
| Links                 | Languages of instruction: English, German   |
| Duration (semesters)  | 1 Semester                                  |
| Module frequency      | unlimited                                   |
| Module level          | MM (Mastermodul / Master module)            |
| Modulart              | Wahlmodul / Opportunity                    |
| Lern-/Lehrform / Type of program | Teilnahme in einem oder mehreren Grundmodulen des Master Biologie |
| Vorkenntnisse / Previous knowledge | Time of examination | Type of examination |
| Examination           | open                                        |
| Final exam of module  | Portfolio                                   |
| Course type           | Seminar                                     |
| SWS                   | 2.00                                        |
| Frequency             | SuSe and WiSe                               |
| Workload attendance   | 28 h                                        |

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.
neu720 - Statistical programming in R

Module label: Statistical programming in R
Module code: neu720
Credit points: 6.0 KP

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

Used in course of study:
- Master's Programme Biology (Master) > Skills Modules
- Master's Programme Biology (Master) > Skills Modules
- Master's Programme Neuroscience (Master) > Skills Modules

Contact person:
Module responsibility
- Fabian Otto-Sobotka
Authorized examiners
- Fabian Otto-Sobotka

Entry requirements:

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

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

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

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

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

Module level: ---
Modulart: Wahlpflicht / Elective

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

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

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

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

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

Used in course of study:

- Bachelor's Programme Biology (Bachelor) > Fachnahe Angebote Biologie
- Bachelor's Programme Business Administration and Law (Bachelor) > Fachnahe Angebote Biologie
- Bachelor's Programme Business Informatics (Bachelor) > Fachnahe Angebote Biologie
- Bachelor's Programme Chemistry (Bachelor) > Fachnahe Angebote Biologie
- Bachelor's Programme Comparative and European Law (Bachelor) > Fachnahe Angebote Biologie
- Bachelor's Programme Computing Science (Bachelor) > Fachnahe Angebote Biologie
- Bachelor's Programme Economics and Business Administration (Bachelor) > Fachnahe Angebote Biologie
- Bachelor's Programme Education (Bachelor) > Fachnahe Angebote Biologie
- Bachelor's Programme Engineering Physics (Bachelor) > Fachnahe Angebote Biologie
- Bachelor's Programme Environmental Science (Bachelor) > Fachnahe Angebote Biologie
- Bachelor's Programme Intercultural Education and Counselling (Bachelor) > Fachnahe Angebote Biologie
- Bachelor's Programme Mathematics (Bachelor) > Fachnahe Angebote Biologie
- Bachelor's Programme Physics (Bachelor) > Fachnahe Angebote Biologie
- Bachelor's Programme Physics, Engineering and Medicine (Bachelor) > Fachnahe Angebote Biologie
- Bachelor's Programme Political Science (Bachelor) > Fachnahe Angebote Biologie
- Bachelor's Programme Social Studies (Bachelor) > Fachnahe Angebote Biologie
- Bachelor's Programme Sustainability Economics (Bachelor) > Fachnahe Angebote Biologie
- Bachelor's Programme Urban and Regional Development (Bachelor) > Fachnahe Angebote Biologie
- Bachelor's Programme Visual Communication and Media (Bachelor) > Fachnahe Angebote Biologie
- Bachelor's Programme Dutch Linguistics and Literary Studies (Bachelor) > Fachnahe Angebote Biologie
- Bachelor's Programme Economics and Business Administration (Bachelor) > Fachnahe Angebote Biologie
- Bachelor's Programme Education (Bachelor) > Fachnahe Angebote Biologie
- Bachelor's Programme Elementary Mathematics (Bachelor) > Fachnahe Angebote Biologie
- Bachelor's Programme English Studies (Bachelor) > Fachnahe Angebote Biologie
- Bachelor's Programme Gender Studies (Bachelor) > Fachnahe Angebote Biologie
- Bachelor's Programme General Education (Bachelor) > Fachnahe Angebote Biologie
- Bachelor's Programme German Studies (Bachelor) > Fachnahe Angebote Biologie
- Bachelor's Programme History (Bachelor) > Fachnahe Angebote Biologie
- Bachelor's Programme Material Culture: Textiles (Bachelor) > Fachnahe Angebote Biologie
- Bachelor's Programme Mathematics (Bachelor) > Fachnahe Angebote Biologie
- Bachelor's Programme Music (Bachelor) > Fachnahe Angebote Biologie
- Bachelor's Programme Philosophy Values and Norms (Bachelor) > Fachnahe Angebote Biologie
- Bachelor's Programme Protestant Theology and Religious Education (Bachelor) > Fachnahe Angebote Biologie
- Bachelor's Programme Slavic Studies (Bachelor) > Fachnahe Angebote Biologie
- Bachelor's Programme Social Studies (Bachelor) > Fachnahe Angebote Biologie
- Bachelor's Programme Special Needs Education (Bachelor) > Fachnahe Angebote Biologie
- Bachelor's Programme Sport Science (Bachelor) > Fachnahe Angebote Biologie
- Bachelor's Programme Technology (Bachelor) > Fachnahe Angebote Biologie
- Fach-Bachelor Pädagogisches Handeln in der Migrationsgesellschaft (Bachelor) > Fachnahe Angebote Biologie
- Master's Programme Biology (Master) > Skills Modules
- Master's Programme Business Administration (Master) > Skills Modules
- Master's Programme Business Administration (Master) > Skills Modules
- Master's Programme Neuroscience (Master) > Skills Modules

Contact person:
Module responsibility: Christine Köppl
Authorized examiners: Christine Köppl
Entry requirements

Skills to be acquired in this module

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

Modulart

Wahlpflicht / Elective

Lern-/Lehrform / Type of program

Vorkenntnisse / Previous knowledge

Examination

Time of examination

Type of 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

Comment

SWS

Frequency

Workload attendance

Lecture

2.00

SuSe

28 h

Seminar und Übung

2.00

SuSe

28 h

Total time of attendance for the module

56 h
# 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>
</tr>
<tr>
<td>Credit points</td>
<td>6.0 KP</td>
</tr>
<tr>
<td>Workload</td>
<td>180 h (4 SWS Supervised exercise (UE) Total workload 180h: 26h contact / 50h group work / 50h prep. of thesis, presentations / 54h recap. literature)</td>
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</table>

**Used in course of study**

- Bachelor's Programme Biology (Bachelor) > Fachnahe Angebote Biologie
- Bachelor's Programme Business Administration and Law (Bachelor) > Fachnahe Angebote Biologie
- Bachelor's Programme Business Informatics (Bachelor) > Fachnahe Angebote Biologie
- Bachelor's Programme Chemistry (Bachelor) > Fachnahe Angebote Biologie
- Bachelor's Programme Comparative and European Law (Bachelor) > Fachnahe Angebote Biologie
- Bachelor's Programme Computing Science (Bachelor) > Fachnahe Angebote Biologie
- Bachelor's Programme Economics and Business Administration (Bachelor) > Fachnahe Angebote Biologie
- Bachelor's Programme Education (Bachelor) > Fachnahe Angebote Biologie
- Bachelor's Programme Engineering Physics (Bachelor) > Fachnahe Angebote Biologie
- Bachelor's Programme Environmental Science (Bachelor) > Fachnahe Angebote Biologie
- Bachelor's Programme Intercultural Education and Counselling (Bachelor) > Fachnahe Angebote Biologie
- Bachelor's Programme Mathematics (Bachelor) > Fachnahe Angebote Biologie
- Bachelor's Programme Physics (Bachelor) > Fachnahe Angebote Biologie
- Bachelor's Programme Physics, Engineering and Medicine (Bachelor) > Fachnahe Angebote Biologie
- Bachelor's Programme Social Studies (Bachelor) > Fachnahe Angebote Biologie
- Bachelor's Programme Sustainability Economics (Bachelor) > Fachnahe Angebote Biologie
- Dual-Subject Bachelor's Programme Art and Media (Bachelor) > Fachnahe Angebote Biologie
- Dual-Subject Bachelor's Programme Biology (Bachelor) > Fachnahe Angebote Biologie
- Dual-Subject Bachelor's Programme Chemistry (Bachelor) > Fachnahe Angebote Biologie
- Dual-Subject Bachelor's Programme Computing Science (Bachelor) > Fachnahe Angebote Biologie
- Dual-Subject Bachelor's Programme Dutch Linguistics and Literary Studies (Bachelor) > Fachnahe Angebote Biologie
- Dual-Subject Bachelor's Programme Education (Bachelor) > Fachnahe Angebote Biologie
- Dual-Subject Bachelor's Programme Economics and Business Administration (Bachelor) > Fachnahe Angebote Biologie
- Dual-Subject Bachelor's Programme Elementary Mathematics (Bachelor) > Fachnahe Angebote Biologie
- Dual-Subject Bachelor's Programme English Studies (Bachelor) > Fachnahe Angebote Biologie
- Dual-Subject Bachelor's Programme Gender Studies (Bachelor) > Fachnahe Angebote Biologie
- Dual-Subject Bachelor's Programme General Education (Bachelor) > Fachnahe Angebote Biologie
- Dual-Subject Bachelor's Programme German Studies (Bachelor) > Fachnahe Angebote Biologie
- Dual-Subject Bachelor's Programme History (Bachelor) > Fachnahe Angebote Biologie
- Dual-Subject Bachelor's Programme Material Culture: Textiles (Bachelor) > Fachnahe Angebote Biologie
- Dual-Subject Bachelor's Programme Mathematics (Bachelor) > Fachnahe Angebote Biologie
- Dual-Subject Bachelor's Programme Music (Bachelor) > Fachnahe Angebote Biologie
- Dual-Subject Bachelor's Programme Philosophy / Values and Norms (Bachelor) > Fachnahe Angebote Biologie
- Dual-Subject Bachelor's Programme Physics (Bachelor) > Fachnahe Angebote Biologie
- Dual-Subject Bachelor's Programme Politics-Economics (Bachelor) > Fachnahe Angebote Biologie
- Dual-Subject Bachelor's Programme Protestant Theology and Religious Education (Bachelor) > Fachnahe Angebote Biologie
- Dual-Subject Bachelor's Programme Slavic Studies (Bachelor) > Fachnahe Angebote Biologie
- Dual-Subject Bachelor's Programme Social Studies (Bachelor) > Fachnahe Angebote Biologie
- Dual-Subject Bachelor's Programme Special Needs Education (Bachelor) > Fachnahe Angebote Biologie
- Dual-Subject Bachelor's Programme Sport Science (Bachelor) > Fachnahe Angebote Biologie
- Dual-Subject Bachelor's Programme Technology (Bachelor) > Fachnahe Angebote Biologie
- Fach-Bachelor Pädagogisches Handeln in der Migrationsgesellschaft (Bachelor) > Fachnahe Angebote Biologie
- Master's Programme Biology (Master) > Skills Modules
- Master's Programme Biology (Master) > Skills Modules
- Master's Programme Neuroscience (Master) > Skills Modules

**Contact person**

- Kathrin Thedieck
- Lena Ebbers

**Authorized examiners**
Entry requirements

Skills to be acquired in this module

- Neurosci. knowlg.
- Expt. methods
- Scient. literature
- Social skills
- Interdiscipl. knowlg.
- Data present./disc.
- Scientific English
- Ethics

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
student
Altern : Zelluläre und molekulare Grundlagen, körperliche Veränderungen und Erkrankungen,
Therapieansa?tze
Ludger Rensing ; Volkhard Rippe

Links

Language of instruction
English
Duration (semesters)
1 Semester
Module frequency
annually, summer term
Module capacity
16
<table>
<thead>
<tr>
<th>Modullevel</th>
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<tr>
<td>Modulart</td>
<td>Wahlpflicht / Elective</td>
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<thead>
<tr>
<th>Lern-/Lehrform</th>
<th>Type of program</th>
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<tbody>
<tr>
<td>Vorkenntnisse</td>
<td>Previous knowledge</td>
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<tr>
<th>Examination</th>
<th>Time of examination</th>
<th>Type of examination</th>
</tr>
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<tbody>
<tr>
<td>Final exam of module</td>
<td>end of semester</td>
<td>portfolio: thesis paper, oral presentation, poster presentation In addition, mandatory but ungraded: questionnaire on ageing theories, meeting protocols</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Course type</th>
<th>Comment</th>
<th>SWS</th>
<th>Frequency</th>
<th>Workload attendance</th>
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<tbody>
<tr>
<td>Lecture</td>
<td></td>
<td>2.00</td>
<td>SuSe</td>
<td>28 h</td>
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<tr>
<td>Exercises</td>
<td></td>
<td>4.00</td>
<td>SuSe</td>
<td>56 h</td>
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| Total time of attendance for the module | 84 h |
neu751 - Laboratory Animal Science

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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>
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<tr>
<td>Workload</td>
<td>90 h (one week full-time in semester break + flexible time for studying and exam preparation 1 SWS Lecture total workload 45h: 2h contact / 20h background reading / 23h exam preparation 1 SWS Supervised exercise total workload 45h: 35h contact / 10h background reading)</td>
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</table>
| Used in course of study | • Master's Programme Biology (Master) > Skills Modules  
                                 • Master's Programme Biology (Master) > Skills Modules  
                                 • Master's Programme Neuroscience (Master) > Skills Modules |
| Contact person        | Module responsibility                           |
|                       | • Christine Köppl                                |
| Authorized examiners  | • Christine Köppl                                |
|                       | • Georg Martin Klump                            |
|                       | • Ulrike Langemann                              |
|                       | • Arne Nolte                                    |
| Entry requirements    | none                                             |
| Skills to be acquired in this module | • ++ Expt. Methods                             |
|                       | • + Independent research                         |
|                       | • + Scient. Literature                          |
|                       | • ++ Social skills                               |
|                       | • ++ Interdiscipl.knowlg.                       |
|                       | • + Scientific English                          |
|                       | • ++ Ethics                                     |

Upon successful completion of this course, students
• know the relevant EU legislation governing animal welfare and are able to explain its meaning in common language
• understand and are able to critically discuss salient ethical concepts in animal experimentation, such as the three Rs and humane endpoint.
• have basic knowledge of the biology and husbandry of laboratory animal species held at the University of Oldenburg (rodents or birds or fish)
• are able to critically assess the needs and welfare of animals without compromising scientific integrity of the investigation
• have practical skills in handling small rodents or birds or fish
• have profound knowledge of anaesthesia, analgesia and basic principles of surgery.
• have practised invasive procedures and euthanasia.

NOTE: These objectives aim to satisfy the requirements for EU directive A „Persons carrying out animal experiments” and EU directive D „Persons killing animals”. We aim to obtain accreditation by the Federation of European Laboratory Animal Science Associations (FeLaSa) by 2018.

Module contents
Background knowledge is taught using the third-party online platform “LAS Interactive” which concludes with a written exam that has to be passed before the practical part. Topics covered are: • Legislation, ethics and the 3Rs • Scientific integrity • Data collection * • Basic biology of rodents, birds and fish • Husbandry, and nutrition of rodents, birds and fish • Animal Welfare • Health monitoring • Pain and distress • Euthanasia Practical procedures will first be demonstrated, important aspects will then be practiced under supervision by every participant, on an animal model of their choice (rodents, birds or fish): • Handling and external examination • Administration of substances, blood sampling • Euthanasia and dissection • Transcardial perfusion • Anaesthesia and surgery

Reader's advisory
"LAS interactive“ internet-based learning platform

Links
Language of instruction English
Duration (semesters) 1 Semester
Module frequency semester break, every semester
Module capacity 15 (Registration procedure / selection criteria: StudIP, sequence of registration)
Modulelevel ---
Modulart je nach Studiengang Pflicht oder Wahlpflicht
Lern-/Lehrform / Type of program
<table>
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<tr>
<th>Vorkenntnisse / Previous knowledge</th>
<th>Time of examination</th>
<th>Type of examination</th>
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<td>immediately before the practical part</td>
<td>written exam of 90 minutes</td>
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<th>Comment</th>
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<th>Frequency</th>
<th>Workload attendance</th>
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<tbody>
<tr>
<td>Lecture</td>
<td></td>
<td>1.00</td>
<td></td>
<td>SuSe and WiSe</td>
</tr>
<tr>
<td>Exercises</td>
<td></td>
<td>1.00</td>
<td></td>
<td>SuSe and WiSe</td>
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**Total time of attendance for the module** 28 h
# neu760 - Scientific English

<table>
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<tbody>
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<td><strong>Module code</strong></td>
<td>neu760</td>
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<tr>
<td><strong>Credit points</strong></td>
<td>6.0 KP</td>
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<tr>
<td><strong>Workload</strong></td>
<td>180 h</td>
</tr>
<tr>
<td>(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>
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<tr>
<td><strong>Used in course of study</strong></td>
<td>Master's Programme Biology (Master) &gt; Skills Modules</td>
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<td></td>
<td>Master's Programme Biology (Master) &gt; Skills Modules</td>
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<tr>
<td></td>
<td>Master's Programme Neuroscience (Master) &gt; Skills Modules</td>
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<tr>
<td><strong>Contact person</strong></td>
<td>Module responsibility</td>
</tr>
<tr>
<td></td>
<td>Christine Köppl</td>
</tr>
<tr>
<td></td>
<td>Authorized examiners</td>
</tr>
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<td></td>
<td>Jannis Hildebrandt</td>
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<tr>
<td><strong>Entry requirements</strong></td>
<td>non-native speakers</td>
</tr>
<tr>
<td><strong>Skills to be acquired in this module</strong></td>
<td>* Neurosci. knowlg.</td>
</tr>
<tr>
<td></td>
<td>++ Social skills</td>
</tr>
<tr>
<td></td>
<td>++ Data present./disc.</td>
</tr>
<tr>
<td></td>
<td>++ Scientific English</td>
</tr>
</tbody>
</table>

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

Language of instruction: English

Duration (semesters): 1 Semester

Module frequency: annually, semester break

Module capacity: 12

Reference text: Usually held in the break before summer term

Additional teachers in the module: outsourced to STELS-OL (Scientific and Technical English Language Service, Oldenburg); native English speaker with in-depth neuroscience knowledge
**Module Level**

**Modulart**
je nach Studiengang Pflicht oder Wahlpflicht

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

**Vorkenntnisse / Previous knowledge**
English level B2 according to Common European Framework of Reference for Languages (CEFR)

**Examination**
Time of examination: within 2 months of completing the course
Type of examination: Portfolio: 50% presentation, 50% assignment; bonus for active participation

<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>
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<tr>
<td>Exercises</td>
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<td>3.00</td>
<td>WiSe</td>
<td>42 h</td>
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</table>

**Total time of attendance for the module**
56 h
neu770 - Basics of Statistical Data Analysis

Module label Basics of Statistical Data Analysis
Module code neu770
Credit points 6.0 KP

Workload 180 h
(1,5 SWS Lecture (VO) Total workload 68h: 28h contact / 20h background reading / 20h exam preparation 2,5 SWS Seminar (SE) Total workload 113h: 28h contact / 20h background reading / 65h exercise solving)

Used in course of study
- Bachelor's Programme Physics, Engineering and Medicine (Bachelor) > Aufbaumodule
- Master's Programme Biology (Master) > Skills Modules
- Master's Programme Biology (Master) > Skills Modules
- Master's Programme Neuroscience (Master) > Skills Modules

Contact person
Module responsibility
- Fabian Otto-Sobotka
Authorized examiners
- Fabian Otto-Sobotka

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

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

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

Reader's advisory Will be available in Stud.IP

Links
Language of instruction English

Duration (semesters) 1 Semester
Module frequency annually, winter term
Module capacity unlimited
Modulelevel ---
Modulart Wahlpflicht / Elective

Lern-/Lehrform / Type of program
Vorkenntnisse / Previous knowledge basic mathematical knowledge; une of probabilities recommended in combination with neu720 Statistical programming with R

Examination
<table>
<thead>
<tr>
<th>Time of examination</th>
<th>Type of examination</th>
</tr>
</thead>
<tbody>
<tr>
<td>after the course</td>
<td>written exam, 2h</td>
</tr>
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</table>

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
The objective of the module is the acquisition of programming skills with focus on analysis of neurobiological datasets, using the programming language python. Python is available for any computer platform (PC, Mac, Linux) and is open source (for free), see https://www.python.org/.

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

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

The module contents:
- Data types and data structures, control structures, functions, modules, file input/output
- Standard libraries and SciPy libraries (Matplotlib, NumPy, ...), scikit-image, VPython, ...

Reader's advisory:
- open access
  http://www.swaroopch.com/notes/python/
  http://docs.python.org/3/tutorial/index.html

Language of instruction: English

Duration (semesters): 1 Semester

Module frequency: semester break, annually

Reference text:
- Shared course components with (cannot be credited twice): pb328 "Einführung in Datenanalyse mit Python" (Professionalisierungsmodul im Bachelorstudiengang Biologie)

Modullevel: ---

Modulart: Wahlpflicht / Elective

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

Examination:
- Time of examination: term break, immediately after the course (2 weeks in February)
- Type of examination: assignment of programming exercises, 4 out of 5 exercises to be assessed

Course type:
- Lecture: 2.00 SWS, WtSe 28 h
- Exercises: 2.00 SWS, WtSe 28 h

Total time of attendance for the module: 56 h
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's Programme Biology (Master) > Skills Modules
- Master's Programme Biology (Master) > Skills Modules
- Master's Programme Neuroscience (Master) > Skills Modules

Contact person:
Module responsibility:
- Jutta Kretzberg

Authorized examiners:
- Jutta Kretzberg
- Jannis Hildebrandt
- Christine Köppi

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.
- put into 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 / DfN colloquium, Hanse lecture neuroscience) and submission of a short (1 page) written summary of each talk.
- 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>
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<tr>
<td>Module capacity</td>
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<tr>
<td>Modullevel</td>
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<tr>
<td>ModularArt</td>
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<tr>
<td>Lern-Lehrform / Type of program</td>
</tr>
<tr>
<td>Vorkenntnisse / Previous knowledge</td>
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<td>Examination</td>
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<tr>
<td>Final exam of module</td>
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<tr>
<td>Course type</td>
</tr>
<tr>
<td>SWS</td>
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<tr>
<td>Frequency</td>
</tr>
<tr>
<td>Workload attendance</td>
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</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's Programme Biology (Master) > Skills Modules
- Master's Programme Biology (Master) > Skills Modules
- Master's Programme Neuroscience (Master) > Skills Modules

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

Entry requirements

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

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

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

Reader's advisory

Links

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

Lern-/Lehrform / Type of program

Vorkenntnisse / Previous knowledge

Examination Time of examination Type of examination
Final exam of module end of summer term Working on exercises 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**

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| Used in course of study    | - Master's Programme Biology (Master) > Skills Modules  
                              - Master's Programme Biology (Master) > Skills Modules  
                              - Master's Programme Neuroscience (Master) > Skills Modules  |
| Contact person             | Module responsibility                      |
|                            | - Jutta Kretzberg                           |
| Authorized examiners       | - Jutta Kretzberg                           |
|                            | - Christine Köppl                          |
|                            | - Jannis Hildebrandt                        |
| Entry requirements         | Skills to be acquired in this module        |
|                            | - Neurosci. knowlg.                         |
|                            | - ++ Independent research                   |
|                            | - ++ Scient. Literature                     |
|                            | - ++ Social skills                          |
|                            | - ++ Interdiscipl. knowlg.                  |
|                            | - ++ Data present./disc.                    |
|                            | - ++ Scientific English                     |
|                            | - ++ Ethics                                 |
|                            | Presentation and critical discussion of own studies in front of an international audience: |
|                            | participate in an international meeting     |
|                            | prepare a poster or talk for an international meeting |
|                            | put own studies into the context of scientific literature |
|                            | acquire additional knowledge about a broader field of research |
| Module contents            | Active participation in a scientific conference, workshop, summer school etc, lasting a minimum of 3 full days.  
                              Student must be the presenter (poster or talk) and an author of the presented work, typically carried out in the context of a research module or the Master thesis. |
| Reader's advisory          | dependent on the scientific topic           |
| Links                      |                                             |
| Language of instruction    | English                                     |
| Duration (semesters)       | 1 Semester                                  |
| Module frequency           | every semester, flexible                    |
| Module capacity            | unlimited (please contact module organizer individually) |
| Modullevel                 | MM (Mastermodul / Master module)            |
| Modulart                   | Wahlpflicht / Elective                      |
| Lern-/Lehrform / Type of program |                                   |

**Examination**

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**Course type**

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**Frequency**

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**Workload attendance**

| 0 h |
### Abschlussmodul

**mam - Master’s Thesis Module**

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