## Background Modules

### bio703 - Basic Concepts in Plant Sciences

<table>
<thead>
<tr>
<th>Module label</th>
<th>Basic Concepts in Plant Sciences</th>
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</thead>
<tbody>
<tr>
<td>Module code</td>
<td>bio703</td>
</tr>
<tr>
<td>Credit points</td>
<td>12.0 KP</td>
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<tr>
<td>Workload</td>
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**Applicability of the module**
- Master's Programme Biology (Master) > Background Modules
- Master's Programme Biology (Master) > Background Modules

**Responsible persons**
- Albach, Dirk Carl (Module responsibility)
- Zotz, Gerhard Wolfgang (Module counselling)
- Laubinger, Sascha (Module counselling)
- von Hagen, Klaus Bernhard (Module counselling)
- Albach, Dirk Carl (Authorized examiners)
- Zotz, Gerhard Wolfgang (Authorized examiners)
- Laubinger, Sascha (Authorized examiners)
- von Hagen, Klaus Bernhard (Authorized examiners)

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

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

**Reader's advisory**

**Links**
- German, English

**Duration (semesters)**
- 1 Semester

**Module frequency**
- 12

**Module capacity**
- 12

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

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

**Modulart / typ of module**
- Wahlpflicht / Elective

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

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

**Final exam of module**
- 1 Portfolio

<table>
<thead>
<tr>
<th>Course type</th>
<th>Comment</th>
<th>SWS</th>
<th>Frequency</th>
<th>Workload of compulsory attendance</th>
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<tr>
<td>Lecture</td>
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<td>WiSe</td>
<td>56</td>
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<td>Seminar</td>
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<td>56</td>
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**Total time of attendance for the module**
- 112 h
bio765 - Current Methods in Plant Sciences - Ecology, Phylogeny and Molecular Biology

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

Module code
bio765

Credit points
12.0 KP

Workload
360 h

Applicability of the module
- Master's Programme Biology (Master) > Background Modules
- Master's Programme Biology (Master) > Background Modules

Responsible persons
Laubinger, Sascha (Module responsibility)
Albach, Dirk Carl (Module counselling)
Zotz, Gerhard Wolfgang (Module counselling)
Laubinger, Sascha (Authorized examiners)
Albach, Dirk Carl (Authorized examiners)
Zotz, Gerhard Wolfgang (Authorized examiners)

Prerequisites

Skills to be acquired in this module
- Acquaintance and practicing ecological, phylogenetic and molecular methods
- Communication of scale- and method-overarching thinking and project planning
- Knowledge of current methods and questions in plant science
- Capacity for teamwork, project- and time management
  - ++ deepened biological expertise
  - ++ deepened knowledge of biological working methods
  - ++ data analysis skills
  - ++ interdisciplinary thinking
  - + critical and analytical thinking
  - + independent searching and knowledge of scientific literature
  - + ability to perform independent biological research
  - + data presentation and discussion 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 / module level
MM (Mastermodul / Master module)

Modulart / typ of module
Wahlpflicht / Elective

Lehr-/Lernform / Teaching/Learning method

Vorkenntnisse / Previous knowledge
Ökologie, Flora, Genetik

Examination

Time of examination
Type of examination
Final exam of module
Portfolio

Course type
Exercises

SWS
8

Frequency
WiSe

Workload attendance
112 h
bio655 - Ornithology

Module label
Ornithology

Module code
bio655

Credit points
12.0 KP

Workload
360 h

Applicability of the module
- Master's Programme Biology (Master) > Background Modules
- Master's Programme Biology (Master) > Background Modules

Responsible persons
- Liedvogel, Miriam (Module responsibility)
- Klump, Georg Martin (Module counselling)
- Bouwhuis, Sandra (Module counselling)
- Köppl, Christine (Module counselling)
- Langemann, Ulrike (Module counselling)
- Bairlein, Franz (Module counselling)
- Mouritsen, Henrik (Module counselling)
- Schmaljohann, Heiko (Module counselling)
- Liedvogel, Miriam (Authorized examiners)
- Klump, Georg Martin (Authorized examiners)
- Bouwhuis, Sandra (Authorized examiners)
- Köppl, Christine (Authorized examiners)
- Langemann, Ulrike (Authorized examiners)
- Mouritsen, Henrik (Authorized examiners)
- Schmaljohann, Heiko (Authorized examiners)

Prerequisites

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 / module level**

MM (Mastermodul / Master module)

**Modulart / typ of module**

Wahlpflicht / Elective

**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 of compulsory attendance**

Lecture

4

WiSe

56

Seminar

4

WiSe

56

**Total time of attendance for the module**

112 h

4 / 69
### bio770 - Field Methods in Organismal Biology

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<th>Module label</th>
<th>Field Methods in Organismal Biology</th>
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<tr>
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<td>bio770</td>
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<tr>
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<td>15.0 KP</td>
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<tr>
<td>Workload</td>
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**Applicability of the module**
- Master's Programme Biology (Master) > Background Modules
- Master's Programme Biology (Master) > Background Modules
- Master's Programme Landscape Ecology (Master) > Basismodule

**Responsible persons**
- Zotz, Gerhard Wolfgang (Module responsibility)
- Gerlach, Gabriele (Module counselling)
- Albach, Dirk Carl (Module counselling)
- Glatzel, Thomas (Module counselling)
- von Hagen, Klaus Bernhard (Module counselling)
- Mouritsen, Henrik (Module counselling)
- Zotz, Gerhard Wolfgang (Authorized examiners)
- Gerlach, Gabriele (Authorized examiners)
- Albach, Dirk Carl (Authorized examiners)
- Glatzel, Thomas (Authorized examiners)
- von Hagen, Klaus Bernhard (Authorized examiners)
- Mouritsen, Henrik (Authorized examiners)

**Prerequisites**
- [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) ++ project and time management ++ statistics & scientific programming [nop]

The module aims at enabling students to apply theoretical knowledge to practical, hypothesis-based field studies within the scope of a seminar. The data derived from the individual projects performed are then to be documented and discussed in the form of a written laboratory course report oriented by a scientific publication and to be written in English. Several teachers cooperate to enable interdisciplinary approaches (e.g. botanical-zoological approaches).

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

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

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

**Languages of instruction**
- German, English

**Duration (semesters)**
- 1 Semester

**Module frequency**
- jährlich

**Module capacity**
- 21

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

**Modulart / type of module**
- Wahlpflicht / Elective

**Lehr-/Lernform / Teaching/Learning method**

**Vorkenntnisse / Previous knowledge**

<table>
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<tr>
<th>Examination</th>
<th>Time of examination</th>
<th>Type of examination</th>
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<tbody>
<tr>
<td>Final exam of module</td>
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<td>2 Presentations (30 %) Laboratory course report on project work (70 %)</td>
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**Course type**
- Exercises

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<th>Comment</th>
<th>SWS</th>
<th>Frequency</th>
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<tr>
<td>Seminar</td>
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<td>(Pflichtveranstaltung für Erstsemester OHNE bisherige Belehrung)</td>
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<td>WiSe</td>
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**Total time of attendance for the module** 168 h
bio720 - Marine Biodiversity

Module label: Marine Biodiversity
Module code: bio720
Credit points: 15.0 KP
Workload: 450 h

Applicability of the module:
- Master's Programme Biology (Master) > Background Modules

Responsible persons:
- Martinez Arbizu, Pedro Miguel (Module responsibility)
- Glatzel, Thomas (Module counselling)
- Martinez Arbizu, Pedro Miguel (Authorized examiners)
- Glatzel, Thomas (Authorized examiners)
- Wehrmann, Achim (Authorized examiners)
- Rossel, Sven (Authorized examiners)
- Gutt, Julian (Authorized examiners)
- Kröncke, Ingrid (Authorized examiners)

Prerequisites:
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
- [nop] Knowledge of fundamentals, topical subjects and methods in Marine Biology and Marine Geology; Studies and critical assessment of the scientific literature.

Module contents:
L: (AW) General Marine Geology
E: Biogenic sedimentation, Interaction benthos-sediment
(SS) Plankton of the oceans; (MH) unicellular plankton; (IK) benthos of the North-Sea; (PM) biodiversity in the deep sea and on seamounts; (JG) conceptions and hypotheses of marine biodiversity, biodiversity of marine vertebrates; (GG) animal migrations and dispersal behaviour. Methods and scientific work on research vessels. A lecture comprises the above-mentioned subjects and imparts marine biological theories, research results and methods. In the seminar, research is presented and discussed. In the laboratory course/exercises, subjects are treated in coordination with the contents of the lecture. With the aid of a computer, data are analysed and interpreted statistically.

Reader's advisory:
as announced in the lecture

Links:

Language of instruction: German
Duration (semesters): 1 Semester
Module frequency: jährlich
Module capacity: unlimited
Modullevel / module level: MM (Mastermodul / Master module)
Modulart / typ of module: Wahlpflicht / Elective

Vorkenntnisse / Previous knowledge:

Examination:

Time of examination:

Type of examination:

Final exam of module:

Written examination (60 %), portfolio (20 %), short presentation (20 %)
Regular active participation is required for the module to be passed.

Course type:
- Lecture
- Exercises
- Seminar

SWS:
- Lecture: 3
- Exercises: 9
- Seminar: 1

Frequency:
- WıSe

Workload of compulsory attendance:
- Lecture: 42 h
- Exercises: 126 h
- Seminar: 14 h

Total time of attendance for the module: 182 h
## bio780 - Biodiversity of Littoral Communities

<table>
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<th>Module label</th>
<th>Biodiversity of Littoral Communities</th>
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<tbody>
<tr>
<td>Module code</td>
<td>bio780</td>
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<tr>
<td>Credit points</td>
<td>15.0 KP</td>
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<tr>
<td>Workload</td>
<td>450 h</td>
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| Applicability of the module | - Master's Programme Biology (Master) > Background Modules  
- Master's Programme Biology (Master) > Background Modules |
| Responsible persons         | Glatzel, Thomas (Module responsibility)  
Martinez Arbizu, Pedro Miguel (Module counselling)  
Glatzel, Thomas (Authorized examiners)  
Martinez Arbizu, Pedro Miguel (Authorized examiners) |
<p>| Prerequisites               | Safe apnoediving with aptitude test and medical fitness certificate |
| Skills to be acquired in this module | [nop] + deepened knowledge of biological working methods + ability to perform independent biological research + teamwork + ethics and professional behaviour + project and time management [nop] By actively participating in this module students acquire qualifications in the following fields: Biological oceanography, marine biology and marine ecology: - Geological formation history of the Mediterranean Sea and Atlantic Ocean, respectively, or the Red Sea and adjacent seas - Oceanography and hydrology - Development of the faunal and floral composition of the Atlantic Ocean, the Mediterranean Sea and the Mediterranean region or the Red Sea (biogeography) - Commercial utilization of the seas and its impacts - Biotopes and biotic communities - Evolution, systematics, morphology, modes of life, and ecology of selected animal groups - Applying theoretical knowledge to real-world organisms/systems - Improved and specialized knowledge of species - Adaptation of life cycles - Interaction between organisms and environment - Dynamics of reef-building and reef-degrading processes - Threat to coral reefs/protection of marine environments Methods: - Formulation and definition of scientific approaches and selection of methods - Observation and investigation of organisms and their habitats (snorkelling/diving) - Documentation of small research projects in groups in the style of a scientific publication - Editorial work to prepare a module report - Popular presentation of results to be published by the media and to be presented at the University Further skills: - Social engagement in groups/teamwork in projects - Independent scientific work in groups - Improvement of scientific discussion culture - Consciousness of the threat to coral reefs - Practising English - Dealing with the culture of the visited region Culture: - History, culture, politics, and religion Additionally: - Physiological aspects of apnoediving - Measures in case of accidents (also caused by &quot;poisonous&quot; organisms) |
| Module contents             | Biodiversity of littoral biotic communities – topographical field research |
| Links                       | German                              |
| Duration (semesters)        | 1 Semester                          |
| Module frequency            | jährlich                            |
| Module capacity             | unlimited                           |
| Modulelevel / module level  | MM (Mastermodul / Master module)    |
| Modulart / typ of module    | Wahlpflicht / Elective              |
| Lehr-/Lernform / Teaching/Learning method |                                |
| Vorkenntnisse / Previous knowledge |                                |</p>
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<tr>
<th>Examination</th>
<th>Time of examination</th>
<th>Type of examination</th>
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<tr>
<td><strong>Final exam of module</strong></td>
<td>during the lectures</td>
<td>2 short presentations (30 %), 1 internship report (70 %) (project report in the style of a scientific publication) PLEASE NOTE: Additional conditions regarding attendance and ungraded activities as determined by the persons responsible for the module will apply.</td>
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<table>
<thead>
<tr>
<th>Course type</th>
<th>Comment</th>
<th>SWS</th>
<th>Frequency</th>
<th>Workload of compulsory attendance</th>
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<td>Seminar</td>
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**Total time of attendance for the module** 168 h
**bio733 - Evolutionary Biology Population Genetics**

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<th><strong>Module label</strong></th>
<th>Evolutionary Biology Population Genetics</th>
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<td><strong>Module code</strong></td>
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<tr>
<td><strong>Credit points</strong></td>
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<tr>
<td><strong>Workload</strong></td>
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**Applicability of the module**
- Master's Programme Biology (Master) > Background Modules
- Master's Programme Biology (Master) > Background Modules

**Responsible persons**
- Gerlach, Gabriele (Module responsibility)
- Albach, Dirk Carl (Module counselling)
- Gerlach, Gabriele (Authorized examiners)
- Albach, Dirk Carl (Authorized examiners)

**Prerequisites**
- none

**Skills to be acquired in this module**
- vertiefte biologische Fachkenntnisse
- vertiefte Kenntnisse biologischer Arbeitstechniken
- Fähigkeit zur Datenaanalyse; kritisches und analytisches Denken
- eigenständige Recherche und Kenntnisse wissenschaftlicher Primärliteratur
- Datenpräsentation und Diskussion in Wort und Schrift (D/E)
- Teamfähigkeit
- Statistik und wissenschaftliches Programmieren

**Module contents**

Übung: Es werden Datensätze und Methoden vorgestellt und angewendet, um die Verbreitung und genetischen Austausch zwischen Populationen zu bestimmen.

**Reader's advisory**
aktuelle wissenschaftliche Artikel zur Evolutionsbiologie
Futuyama D. Evolutionary Biology, Elsevier, Hartl & Clark Principles of Population Genetics, Sinauer

**Links**
- German, English

**Languages of instruction**
- German, English

**Duration (semesters)**
- 1 Semester

**Module frequency**

**Module capacity**
- 12

**Reference text**
associated with bio736 (Evolutionary Transcriptomics) (recommended)

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

**Modulart / typ of module**
- Wahlpflicht / Elective

**Lehr-/Lernform / Teaching/Learning method**

**Vorkenntnisse / Previous knowledge**
- Grundkenntnisse Evolutionsbiologie

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

**Final exam of module**
- portfolio (60%)
- presentation (40%)

**Course type**

<table>
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<tr>
<th>Comment</th>
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<th>Frequency</th>
<th>Workload of compulsory attendance</th>
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<tr>
<td>Lecture</td>
<td>1</td>
<td>WISe</td>
<td>14</td>
</tr>
<tr>
<td>Exercises</td>
<td>3</td>
<td>WISe</td>
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**Total time of attendance for the module**
- 56 h
### bio736 - Evolutionary Transcriptomics

<table>
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<th>Evolutionary Transcriptomics</th>
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<tbody>
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<td>Workload</td>
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<td>Applicability of the module</td>
<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>
</tr>
<tr>
<td>Responsible persons</td>
<td>Nolte, Arne (Module responsibility)</td>
</tr>
<tr>
<td></td>
<td>Laubinger, Sascha (Module counselling)</td>
</tr>
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<td></td>
<td>Gowik, Udo (Module counselling)</td>
</tr>
<tr>
<td></td>
<td>Nolte, Arne (Authorized examiners)</td>
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<td></td>
<td>Laubinger, Sascha (Authorized examiners)</td>
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<td>Gowik, Udo (Authorized examiners)</td>
</tr>
<tr>
<td>Prerequisites</td>
<td>none</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; ++ critical and analytical thinking</td>
</tr>
<tr>
<td></td>
<td>+ independent searching and knowledge of scientific literature</td>
</tr>
<tr>
<td></td>
<td>++ data presentation and discussion in English (written and spoken)</td>
</tr>
<tr>
<td></td>
<td>++ statistics &amp; scientific programming</td>
</tr>
<tr>
<td>Module contents</td>
<td>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.</td>
</tr>
<tr>
<td></td>
<td>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.</td>
</tr>
</tbody>
</table>

#### 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>12</td>
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<tr>
<td>Module capacity</td>
<td></td>
</tr>
<tr>
<td>Reference text</td>
<td>associated with bio733: Evolutionary Biology Population Genetics (recommended)</td>
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<tr>
<td>Modullevel / module level</td>
<td>MM (Mastermodul / Master module)</td>
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#### Vorkenntnisse / Previous knowledge

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#### Examination

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#### Total time of attendance for the module

| 56 h |
bio675 - Molecular Ecology

Module label: Molecular Ecology
Module code: bio675
Credit points: 12.0 KP
Workload: 360 h

Applicability of the module:
- Master's Programme Biology (Master) > Background Modules
- Master's Programme Biology (Master) > Background Modules
- Master's Programme Landscape Ecology (Master) > Basiimodule

Responsible persons:
- Nolte, Arne (Module responsibility)
- Gerlach, Gabriele (Module counselling)
- Nolte, Arne (Authorized examiners)
- Gerlach, Gabriele (Authorized examiners)

Prerequisites:
- 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

Languages of instruction:
- German, English

Duration (semesters):
- 1 Semester

Module frequency:
- 15

Reference text:
associated with bio890 Current Topics of Biology (Seminar)

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

Modulart / typ of module:
- Wahlpflicht / Elective

Vorkenntnisse / Previous knowledge:

Examination:
- Time of examination: during the module
- Type of examination: Präsentationen (50%), Portfolio (50%). Regular participation is a prerequisite to pass in the module.

Course type:
- Lecture

Comment:
- SWS
- Frequency
- Workload of compulsory attendance

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**Total time of attendance for the module** 112 h
### bio605 - Molecular Genetics and Cell Biology

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<td>Workload</td>
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**Applicability of the module**
- Master's Programme Biology (Master) > Background Modules
- Master's Programme Biology (Master) > Background Modules
- Master's Programme Molecular Biomedicine (Master) > Background Modules
- Master's Programme Neuroscience (Master) > Background Modules

**Responsible persons**
- Neidhardt, John (Module responsibility)
- Neidhardt, John (Authorized examiners)
- Koch, Karl-Wilhelm (Authorized examiners)

**Prerequisites**
- BSc (Biologie, Biochemie)

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

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

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

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

**Links**
- http://www.uni-oldenburg.de/humangenetik/

**Language of instruction**
- English

**Duration (semesters)**
- 1 Semester

**Module frequency**
- 15

**Reference text**
- associated with bio900

**Modulart / typ of module**
- Wahlpflicht / Elective

**Lehr-/Lernform / Teaching/Learning method**
- Zellbiologische Grundkenntnisse, Genetik, Biochemie

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

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

**Course type**

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bio845 - Introduction to Development and Evolution

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<td></td>
<td>Claußen, Maike (Authorized examiners)</td>
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Skills to be acquired in this module

Upon successful completion of this course, students

- know the fundamental problems organisms share in development
- know the common basic steps of ontogenesis after comparing the life cycles of different species (both vertebrates and invertebrates)
- know the fundamentals of the genetic control of cell-fate specification, morphogenesis, and organogenesis
- know the principles of gene regulatory networks in development and are able to explain examples
- are able to explain and discuss mechanisms of development across taxonomic groups and questions about the evolution of developmental mechanisms
- have in-depth knowledge of the development of animal nervous systems, including cellular and net-work properties

skills:

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

Module contents

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

- Introduction to Developmental Biology
- Cell-Cell Communication
- Differential Gene Expression (I and II)
- Early Development of Vertebrates, Gastrulation
- Neurulation
- Brain Development
- Axonal Growth, Target Selection, Synaptogenesis and Refinement
- Neural Crest
- Mesoderm Development
- Morphogenesis
- Developmental Mechanisms of Evolutionary Change
- Model Organisms in Developmental Biology
- Transgenic Mice
- Medical Implications of Developmental Biology

Reader's advisory

Literature:

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

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<td>Vorkenntnisse / Previous knowledge</td>
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\[17/69\]
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

Applicability of the module:
- Master's Programme Biology (Master) > Background Modules
- Master's Programme Biology (Master) > Background Modules
- Master's Programme Neuroscience (Master) > Background Modules

Responsible persons:
- Sienknecht, Ulrike (Module responsibility)
- Sienknecht, Ulrike (Module counselling)
- Sienknecht, Ulrike (Authorized examiners)
- Claußen, Maike (Authorized examiners)
- Ebbers, Lena (Authorized examiners)

Prerequisites:
**Mandatory** prerequisite is the module bio845 (neu110) (Introduction to Development and Evolution)

Skills to be acquired in this module:
Upon successful completion of this course, students have skills in methods of developmental biology:
- are capable of performing live embryo husbandry
- are able to carry out in-ovo stainings
- are familiar with the use of embryonic stage discrimination standards for model organisms
- document the observed embryonic stages by drawings with anatomical labelling
- are familiar with tissue preparation (including cryosectioning), the use of different molecular markers, and immunohistological staining methods
- microscopy, data analysis, and photographic data documentation
- know the standards of proper documentation of research data and the universal format of a lab notebook
- know how to carry out formal laboratory reports (and the structure of a scientific paper)
- have basic knowledge in the field of auditory system development
- have basic knowledge of the organisation of the auditory system across vertebrate groups
- have basic knowledge of the development of the middle and inner ear, as well as selected auditory brain centres

are able to summarize current hypotheses about the evolution of the auditory system in vertebrates skills:
++ deepened biological expertise
++ deepened knowledge of biological working methods
++ data analysis skills
++ critical and analytical thinking
+ independent searching and knowledge of scientific literature
++ ability to perform independent biological research
+ data presentation and discussion (written and spoken)
+ teamwork
+ ethics and professional behaviour
+ project and time management

Module contents:
Lab exercises in developmental biology of auditory research model organisms, such as chicken and mouse
embryos. Practical introduction to methods, such as in-ovo live observation; developmental stage discrimination and description, tissue preparation for histology, sectioning, staining, and microscopy, including data analyses. Seminars in the field of auditory system development and methods based on current literature

### Reader's advisory


### Links

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<tr>
<th>Language of instruction</th>
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### Vorkenntnisse / Previous knowledge

Organismic biology, experience with lab work

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### Course type

Exercises

### SWS

6

### Frequency

WiSe

### Workload attendance

84 h
### bio860 - Comparative Developmental Biology

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**Prerequisites**

**Skills to be acquired in this module**

- [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

**Module contents**

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

**Reader's advisory**


**Language of instruction**

English

**Duration (semesters)**

1 Semester

**Module capacity**

6 (Reihenfolge der Anmeldungen)

**Reference text**

associated with bio845 Introduction to Development and Evolution

**Modullevel / module level**

MM (Mastermodul / Master module)

**Modulart / typ of module**

Wahlpflicht / Elective

**Lehr-/Lernform / Teaching/Learning method**

organismic biology, experience with lab work

**Vorkenntnisse / Previous knowledge**

organismic biology, experience with lab work

**Final exam of module**

same summer term 1 portfolio

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**Total time of attendance for the module**

56 h
bio695 - Biochemical concepts in signal transduction

Module label: Biochemical concepts in signal transduction
Module code: bio695
Credit points: 12.0 KP
Workload: 360 h

Applicability of the module:
- Master's Programme Biology (Master) > Background Modules
- Master's Programme Molecular Biomedicine (Master) > Background Modules
- Master's Programme Neuroscience (Master) > Background Modules

Responsible persons:
Koch, Karl-Wilhelm (Module responsibility)
Scholten, Alexander (Module counselling)
Koch, Karl-Wilhelm (Authorized examiners)
Scholten, Alexander (Authorized examiners)

Prerequisites:
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 / module level: MM (Mastermodul / Master module)
Modulart / typ of module: Wahlpflicht / Elective

Vorkenntnisse / Previous knowledge:

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Course type:
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Total time of attendance for the module: 112 h
neu210 - Neurosensory Science and Behaviour

Module label: Neurosensory Science and Behaviour
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

Applicability of the module
- Master's Programme Biology (Master) > Background Modules
- Master's Programme Biology (Master) > Background Modules
- Master's Programme Neuroscience (Master) > Background Modules

Responsible persons
- Klump, Georg Martin (Module responsibility)
- Langemann, Ulrike (Module counselling)
- Mouritsen, Henrik (Module counselling)
- Klump, Georg Martin (Authorized examiners)
- Mouritsen, Henrik (Authorized examiners)
- Hildebrandt, Jannis (Authorized examiners)
- Langemann, Ulrike (Authorized examiners)

Prerequisites
- Fundamentals of Neurobiology, Behavioural Biology, Evolution, Ecology

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

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

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

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

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

Reader’s advisory

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.

Module level / module level
je nach Studiengang Pflicht oder Wahlpflicht

Teaching/Learning method

22 / 69
### Vorkenntnisse / Previous knowledge

- Fundamentals of Neurobiology, Behavioural Biology, Evolution, Ecology

### Examination

<table>
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<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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### Final exam of module

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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

**Applicability of the module**
- Master's Programme Biology (Master) > Background Modules
- Master's Programme Molecular Biomedicine (Master) > Background Modules
- Master's Programme Neuroscience (Master) > Background Modules

**Responsible persons**
Thiel, Christiane Margarete (Module responsibility)
Thiel, Christiane Margarete (Module counselling)
Thiel, Christiane Margarete (Authorized examiners)
Gießing, Carsten (Authorized examiners)

**Prerequisites**

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

- Upon successful completion of this course, students
- know the fundamentals of neurotransmission
- know the basic neural mechanisms underlying attention, learning, emotion, language and executive functions
- understand the relationship between disturbances in neurotransmitter systems, cognitive functions and psychiatric disease
- know the 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
### Duration (semesters)
1 Semester

### Module frequency
jährlich

### Module capacity
30 (Recommended in combination with neu210 "Neurosensory Science and Behaviour", neu300 "Functional MRI data analysis" Shared course components with (cannot be credited twice): bio610 and psy181 (5.02.614 "Introduction to Cognitive Neuroscience", 5.02.615 "Psychopharmacology")

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

### Module level / module level
je nach Studiengang Pflicht oder Wahlpflicht

### Lehr-/Lernform / Teaching/Learning method

### Vorkenntnisse / Previous knowledge
Fundamentals of Neurobiology, Behavioural Biology

### Examination
<table>
<thead>
<tr>
<th>Time of examination</th>
<th>Type of examination</th>
</tr>
</thead>
<tbody>
<tr>
<td>as agreed, usually in the break after the winter term</td>
<td>100% written exam (content of the lectures)</td>
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### Course type

<table>
<thead>
<tr>
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### Total time of attendance for the module
56 h
neu141 - Visual Neuroscience - Physiology and Anatomy

<table>
<thead>
<tr>
<th>Module label</th>
<th>Visual Neuroscience - Physiology and Anatomy</th>
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<tbody>
<tr>
<td>Module code</td>
<td>neu141</td>
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<tr>
<td>Credit points</td>
<td>12.0 KP</td>
</tr>
</tbody>
</table>

**Workload**

360 h

- 3 SWS Lecture (VO)
- Total workload 90 h: 30h background literature reading and preparation for sh
- 1 SWS Seminar (SE)
- Total workload 30h: 10h contact / 20h literature reading and preparation of result presentation
- 8 SWS Supervised exercise (UE)
- Total workload 240h: 200h contact / 40h results analysis, writing of short reports for portfolio

**Applicability of the module**

- Master's Programme Biology (Master) > Background Modules
- Master's Programme Biology (Master) > Background Modules
- Master's Programme Molecular Biomedicine (Master) > Background Modules
- Master's Programme Neuroscience (Master) > Background Modules

**Responsible persons**

- Greschner, Martin (Module responsibility)
- Greschner, Martin (Authorized examiners)
- Dedek, Karin (Authorized examiners)
- Janssen-Bienhold, Ulrike (Authorized examiners)
- Puller, Christian (Authorized examiners)

**Prerequisites**

Basic knowledge of neurobiology

**Skills to be acquired in this module**

++ Neurosci. knowlg.
++ Expt. Methods
+ Independent research
++ Scient. Literature
+ Social skills
+ Maths/Stats/Progr.
++ Data present./disc.
+ Scientific English
+ Ethics

Upon successful completion of this course, students

- have basic knowledge of electrophysiological techniques used in neuroscience research
- have acquired first practical skills in some electrophysiological techniques
- have acquired basic skills in data analysis
- have knowledge on retinal physiology and anatomy of the visual system
- have basic knowledge of brain structures and their function
- have profound knowledge of the architecture and circuits of the vertebrate retina
- have 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 neur'anatomy 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
<table>
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<tr>
<th>Duration (semesters)</th>
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<tbody>
<tr>
<td>Module frequency</td>
<td>annually, summer term, first half (full time)</td>
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<tr>
<td>Module capacity</td>
<td>12 - with Visual Neuroscience: Anatomy (Shared course components with (cannot be credited twice): neu151 BM Visual Neuroscience: Anatomy)</td>
</tr>
<tr>
<td>Modullevel / module level</td>
<td>MM (Mastermodul / Master module)</td>
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<td>Modulart / typ of module</td>
<td>Wahlpflicht / Elective</td>
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<td>Vorkenntnisse / Previous knowledge</td>
<td>Basic knowledge in neurobiology</td>
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**neu150 - Visual Neuroscience - Anatomy**

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<tr>
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</table>
| Applicability of the module | Master's Programme Biology (Master) > Background Modules  
|                        | Master's Programme Molecular Biomedicine (Master) > Background Modules  
|                        | Master's Programme Neuroscience (Master) > Background Modules  |
| Responsible persons    | Janssen-Bienhold, Ulrike (Module responsibility)  
|                        | Dedek, Karin (Module counselling)  
|                        | Janssen-Bienhold, Ulrike (Authorized examiners)  
|                        | Dedek, Karin (Authorized examiners)  |
| Prerequisites          | attendance in pre-meeting                 |
|                        | 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 / module level | BC (Basiscurriculum / Base curriculum)  |
| Modulart / typ of module | je nach Studiengang Pflicht oder Wahlpflicht  |
| Vorkenntnisse / Previous knowledge |  |
| Examination            | Time of examination: Summer semester, first half  
|                        | Type of examination: Portfolio (75 %), report (25%)  |
| Final exam of module   | Course type: Lecture  
|                        | Comment: 1  
|                        | SWS: 1  
|                        | Frequency: SuSe  
|                        | Workload of compulsory attendance: 14  
|                        | Seminar: 1  
|                        | SWS: 1  
|                        | Frequency: SuSe  
|                        | Workload of compulsory attendance: 14  
|                        | Practical training: 3  
|                        | SWS: 3  
|                        | Frequency: SuSe  
|                        | Workload of compulsory attendance: 42  
| Total time of attendance for the module | 70 h  |
neu290 - Biophysics of Sensory Reception

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

Workload: 180 h
- 2 SWS Lecture (VO) Total workload 90h: 30h contact / 60h individual reading
- 2 SWS Seminar (SE) Total workload 90h: 30h contact / 60h individual reading

Applicability of the module:
- Master's Programme Biology (Master) > Background Modules
- Master's Programme Biology (Master) > Background Modules
- Master's Programme Neuroscience (Master) > Background Modules

Responsible persons:
Winklhofer, Michael (Module responsibility)
Winklhofer, Michael (Authorized examiners)
Winklhofer, Michael (Module counselling)

Prerequisites:
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:
General aspects of sensory reception and signal transduction: adequate stimulus, threshold sensitivity and signal-to-noise limitations, activation of receptor proteins, evolutionary and ecological aspects of sensory reception
The senses: Chemoreception in the gustatory cells and olfactory sensory neurons
Thermoreception in the skin
Infrared reception in the pit organ
Mechanoreception - auditory hair cells, somatosensory neurons in the skin, lateral line, proprioceptors, baroceptors
Photoreception - ciliary and rhabdomeric photoreceptor cells;
Electroreception in Lorenzini ampullae of elasmobranch fish and in tuberous receptors of mormyrid fish; derived electoreceptors in aquatic mammals
Magnetoreception - candidate structural correlates of magnetoreceptors

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:
  2012;4:a005991;

Links:
Language of instruction: English
Duration (semesters): 1 Semester
Module frequency: annually, summer term, second half
Module capacity: 20
Modullevel / module level: MM (Mastermodul / Master module)
Modulart / typ of module: Wahlpflicht / Elective
**Lehr-/Lernform / Teaching/Learning method**

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<th>Vorkenntnisse / Previous knowledge</th>
<th>cell biology of neurons</th>
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<table>
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<th>Examination</th>
<th>Time of examination</th>
<th>Type of examination</th>
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<tr>
<td>Final exam of module</td>
<td>appr. one week after the last lecture</td>
<td>Type of examination: written exam (75%), presentation in the seminar (25%) In addition, mandatory but ungraded: presentation on seminar</td>
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<th>SWS</th>
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<tr>
<td>Seminar</td>
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<td>2</td>
<td>SuSe</td>
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**Total time of attendance for the module** 56 h
### neu360 - Auditory Neuroscience

<table>
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<tr>
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<tr>
<td>Workload</td>
<td>180 h</td>
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<tr>
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<tr>
<td>1 SWS Lecture (VO)</td>
<td>Total workload 45h: 14 h contact / 31 h background reading</td>
</tr>
<tr>
<td>1 SWS Seminar (SE)</td>
<td>Total workload 45h: 14 h contact / 15 h background reading / 16 h preparation and presentation</td>
</tr>
<tr>
<td>2 SWS Supervised exercise (UE)</td>
<td>Total workload 90h: 10 h contact / 20 h literature search / 60 h work on essay paper</td>
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**Applicability of the module**
- Master's Programme Biology (Master) > Background Modules
- Master's Programme Biology (Master) > Background Modules
- Master's Programme Neuroscience (Master) > Background Modules

**Responsible persons**
- Köppl, Christine (Module responsibility)
- Klump, Georg Martin (Authorized examiners)
- Köppl, Christine (Authorized examiners)

**Prerequisites**
Recommended previous knowledge/skills: Basics of Neurosensory Science and Behavioural Biology

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

Introduction to Auditory Physiology. May serve as preparation for a Research Module in this area.

Upon successful completion of this course, students
- have profound knowledge on auditory sensory processing at several levels (including cochlear transduction mechanisms, central auditory processing)
- have basic knowledge of the large range of techniques used in auditory research
- are able to read and critically report to others on an original research paper in auditory neuroscience
- are able to research and review a specific topic in auditory neuroscience

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

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

**Reader's advisory**
About 20 selected original papers (selection varies)
- Pickles JO (2012) An Introduction to the Physiology of Hearing. Brill, Netherlands

**Links**
- Language of instruction: English
- Duration (semesters): 1 Semester
- Module frequency: annually, summer term, second half
- Module capacity: 15 (BM neu211 "Neurosensory Science and Behaviour" or BM neu270 "Neurocognition and Psychophysics")
or skills module biox "Current Topics in Hearing Science"

<table>
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<tr>
<th>Reference text</th>
<th>Registration procedure / selection criteria: StudIP, final acceptance after assignment of seminar presentation</th>
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<tbody>
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<td>Basics of Neurosensory Science and Behavioural Biology</td>
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<td>Examination</td>
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<td>within a few weeks of the end of summer term lecture period</td>
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Total time of attendance for the module 56 h
**neu340 - Invertebrate Neuroscience**

**Module label**  
Invertebrate Neuroscience

**Module code**  
neu340

**Credit points**  
6.0 KP

**Workload**  
180 h

- 2 SWS Seminar (SE)
  - Total workload 72h: 28h contact / 44h background literature reading, preparation for short tests, portfolio assignments and results presentation
- 3 SWS Supervised exercise (UE)
  - Total workload 108h: 42h contact / 66h data analysis and preparation of portfolio assignments

**Applicability of the module**
- Master’s Programme Biology (Master) > Background Modules
- Master’s Programme Biology (Master) > Background Modules
- Master’s Programme Neuroscience (Master) > Background Modules

**Responsible persons**
- Kretzberg, Jutta (Module responsibility)
- Kretzberg, Jutta (Authorized examiners)

**Prerequisites**
- attendance in pre-meeting

**Skills to be acquired in this module**
- ++ Neurosci. knowlg.
- ++ Expt. Methods
- + Scient. Literature
- + Social skills
- + Maths/Stats/Progr.
- + Independent Research
- + Data present./disc.
- + Scientific English
- + Ethics

Upon successful completion of this course, students
- have knowledge on invertebrate neuronal systems in comparison to vertebrate systems
- have discussed an overview of experimental and theoretical methods of invertebrate 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 module consists of three weeks of seminar and hands-on lab exercises on intracellular recordings from leech neurons, as well as computer simulations to study the basis of membrane potential and action potential generation.

The seminar covers the following topics:
- Invertebrate neuronal systems in comparison to vertebrate systems
- Ion channels, membrane potential and action potential generation
- Introduction to electrophysiological methods
- Introduction to data analysis methods

In the practical exercises, portfolio assignments will be performed on:
- Qualitative electrophysiological classification of different cell types in the leech nervous system
- Quantitative analysis (stimulus - response relationship) of at least one cell type
- Action potential generation: Comparison of model simulations and experiments
- Planning a small individual team-work project based on the techniques taught in this module, that can be used as basis for the module neu345

**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
<table>
<thead>
<tr>
<th><strong>Links</strong></th>
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<tr>
<td><strong>Language of instruction</strong></td>
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<td><strong>Duration (semesters)</strong></td>
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<td><strong>Module frequency</strong></td>
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<td><strong>Module capacity</strong></td>
<td>12 (This module provides the background for neu345 &quot;Neural Computation in invertebrate systems&quot;)</td>
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<td>Wahlpflicht / Elective</td>
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<td><strong>Total time of attendance for the module</strong></td>
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neu300 - Functional MRI data analysis

Module label: Functional MRI data analysis
Module code: neu300
Credit points: 12.0 KP

Workload:
- 360 h
  - 3 SWS Practical (PR) Total workload 225h: 70h contact / 100h experimental work / 55h exam preparation
  - 2 SWS Lecture (VO) Total workload 90h: 28h contact / 32h background reading / 30h exam preparation
  - 1 SWS Seminar (SE) Total workload 45h: 15h contact / 30h preparation of presentation

Applicability of the module:
- Master's Programme Biology (Master) > Background Modules
- Master's Programme Neuroscience (Master) > Background Modules

Responsible persons:
- Gießing, Carsten (Module responsibility)
- Gießing, Carsten (Authorized examiners)
- Thiel, Christiane Margarete (Authorized examiners)

Prerequisites:
- Skills to be acquired in this module:
  - Neurosci. knowlg.
  - Expt. Methods
  - Social skills
  - Interdiscipl. 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 module 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)

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

Moduleart / typ of module:
- Wahlpflicht / Elective

Vorkenntnisse / Previous knowledge:
- Examination: Time of examination: end of summer term
- Type of examination: 70% oral exam or written exam, 30% presentations
- In addition, mandatory but ungraded: Regular active participation

Course type:
- Practical training: SWS 5, Frequency: SuSe, Workload of compulsory attendance: 70
- Seminar: SWS 1, Frequency: SuSe, Workload of compulsory attendance: 14
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<th>SWS</th>
<th>Frequency</th>
<th>Workload of compulsory attendance</th>
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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

Applicability of the module:
- Master's Programme Biology (Master) > Background Modules
- Master's Programme Biology (Master) > Background Modules
- Master's Programme Neuroscience (Master) > Background Modules

Responsible persons:
- Klump, Georg Martin (Module responsibility)
- Klump, Georg Martin (Authorized examiners)
- Langemann, Ulrike (Authorized examiners)

Prerequisites:
- + Neurosci. knowlg.
- ++ Expt. Methods
- + Social skills
- ++ Maths/Stats/Progr.
- + Data present./disc.
- + Scientific English

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

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:
- English

Duration (semesters):
- 1 Semester

Module frequency:
- annually, summer term, second half

Module capacity:
- 6 (in total with bio640)

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

Modulart / typ of module:
- Wahlpflicht / Elective

Lehr-/Lernform / Teaching/Learning method:

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: 1
- Seminar: 2
- Practical training: 5
- Lecture: 0

Workload of compulsory attendance:
- 14
- 28
- 70
- 0

Total time of attendance for the module: 112 h
### Research Modules

**bio900 - Biology Research Module**

<table>
<thead>
<tr>
<th>Module label</th>
<th>Biology Research Module</th>
</tr>
</thead>
<tbody>
<tr>
<td>Module code</td>
<td>bio900</td>
</tr>
<tr>
<td>Credit points</td>
<td>15.0 KP</td>
</tr>
<tr>
<td>Workload</td>
<td>450 h</td>
</tr>
</tbody>
</table>

#### Applicability of the module
- Master's Programme Biology (Master) > Research Modules
- Master's Programme Biology (Master) > Research Modules

#### Responsible persons
- Zotz, Gerhard Wolfgang (Module responsibility)
- der Biologie, Lehrende (Module counselling)
- Zotz, Gerhard Wolfgang (Authorized examiners)
- der Biologie, Lehrende (Authorized examiners)

#### Prerequisites
- project and supervisor(s) need to be approved by the exam board prior to the start of lab work

**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
- **Languages of instruction**
  - German, English

#### Duration (semesters)
- 1 Semester

#### Module frequency

#### Module capacity
- unlimited

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

#### Modulart / typ of module
- MM (Mastermodul / Master module)
- Wahlpflicht / Elective

#### Vorkenntnisse / Previous knowledge

#### Examination
- Time of examination
- Type of examination

#### Final exam of module
- internship report
<table>
<thead>
<tr>
<th>Course type</th>
<th>Comment</th>
<th>SWS</th>
<th>Frequency</th>
<th>Workload of compulsory attendance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecture</td>
<td></td>
<td></td>
<td>SoSe oder WiSe</td>
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<tr>
<td>Seminar</td>
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<td>SoSe oder WiSe</td>
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<tr>
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<td>10</td>
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**Total time of attendance for the module** 140 h
bio810 - Independent Research

<table>
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<tr>
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<th>Independent Research</th>
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<tbody>
<tr>
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<td>Workload</td>
<td>450 h</td>
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<tr>
<td>Applicability of the module</td>
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<tr>
<td>Master's Programme Biology (Master) &gt; Research Modules</td>
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<tr>
<td>Master's Programme Biology (Master) &gt; Research Modules</td>
<td></td>
</tr>
<tr>
<td>Responsible persons</td>
<td></td>
</tr>
<tr>
<td>Zotz, Gerhard Wolfgang (Module responsibility)</td>
<td></td>
</tr>
<tr>
<td>Zotz, Gerhard Wolfgang (Authorized examiners)</td>
<td></td>
</tr>
<tr>
<td>der Biologie, Lehrende (Authorized examiners)</td>
<td></td>
</tr>
<tr>
<td>Prerequisites</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>
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<tr>
<td>Skills to be acquired in this module</td>
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<tr>
<td><strong>++ deepened biological expertise</strong></td>
<td></td>
</tr>
<tr>
<td><strong>++ deepened knowledge of biological working methods</strong></td>
<td></td>
</tr>
<tr>
<td><strong>++ data analysis skills</strong></td>
<td></td>
</tr>
<tr>
<td><strong>++ critical and analytical thinking</strong></td>
<td></td>
</tr>
<tr>
<td><strong>++ independent searching and knowledge of scientific literature</strong></td>
<td></td>
</tr>
<tr>
<td><strong>++ ability to perform independent biological research</strong></td>
<td></td>
</tr>
<tr>
<td><strong>++ data presentation and discussion in German and English (written and spoken)</strong></td>
<td></td>
</tr>
<tr>
<td><strong>+ teamwork</strong></td>
<td></td>
</tr>
<tr>
<td><strong>+ project and time management</strong></td>
<td></td>
</tr>
<tr>
<td><strong>++ statistics &amp; scientific programming</strong></td>
<td></td>
</tr>
<tr>
<td>Students perform individual research projects to learn:</td>
<td></td>
</tr>
<tr>
<td>• planning and organization of a research project in a group outside of University of Oldenburg</td>
<td></td>
</tr>
<tr>
<td>• formulate a scientific hypothesis</td>
<td></td>
</tr>
<tr>
<td>• planning, performing and analyzing experiments and / or simulations</td>
<td></td>
</tr>
<tr>
<td>• working with scientific background literature on the specific context of the project</td>
<td></td>
</tr>
<tr>
<td>• oral presentation and discussion of backgrounds and results in the lab seminar</td>
<td></td>
</tr>
<tr>
<td>• write a scientific report in publication format</td>
<td></td>
</tr>
<tr>
<td>• prepare and present a scientific poster</td>
<td></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.</td>
<td></td>
</tr>
<tr>
<td>Note:</td>
<td></td>
</tr>
<tr>
<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>
<td></td>
</tr>
<tr>
<td>• prior to project start, external and local supervisors must fill the learning agreement form</td>
<td></td>
</tr>
<tr>
<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>
<td></td>
</tr>
<tr>
<td>• participation in a joint poster presentation of concurrent research modules is highly recommended.</td>
<td></td>
</tr>
<tr>
<td>Reader's advisory</td>
<td>varies with chosen topic</td>
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<td>Duration (semesters)</td>
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<td>Module frequency</td>
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<tr>
<td>Module capacity</td>
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<td>Modullevel / module level</td>
<td>MM (Mastermodul / Master module)</td>
</tr>
<tr>
<td>Modulart / typ of module</td>
<td>Wahlpflicht / Elective</td>
</tr>
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</table>

Notes:

- 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.
### Vorkenntnisse / Previous knowledge

<table>
<thead>
<tr>
<th>Examination</th>
<th>Time of examination</th>
<th>Type of examination</th>
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<tbody>
<tr>
<td>Final exam of module</td>
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<td>internship report</td>
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<table>
<thead>
<tr>
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<th>Comment</th>
<th>SWS</th>
<th>Frequency</th>
<th>Workload of compulsory attendance</th>
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<tr>
<td>Seminar</td>
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</table>

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

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<tr>
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<td>Module code</td>
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**Applicability of the module**
- Master's Programme Biology (Master) > Research Modules
- Master's Programme Biology (Master) > Research Modules

**Responsible persons**
- Klump, Georg Martin (Module responsibility)
- Klump, Georg Martin (Authorized examiners)

**Prerequisites**
- ++ 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

**Modulart / module level**
- je nach Studiengang Pflicht oder Wahlpflicht

**Lehr-/Lernform / Teaching/Learning method**
- internship report

**Vorkenntnisse / Previous knowledge**

**Examination**

<table>
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**Final exam of module**

**Course type**
- Seminar

**SWS**

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<table>
<thead>
<tr>
<th>Workload attendance</th>
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<tbody>
<tr>
<td>0 h</td>
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Skills Modules

bio870 - Communicating Plant Sciences

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<td>Module code</td>
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<td>Credit points</td>
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<td>Workload</td>
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<td>Applicability of the module</td>
<td>Master's Programme Biology (Master) &gt; Skills Modules</td>
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<tr>
<td>Responsible persons</td>
<td>Zotz, Gerhard Wolfgang (Module responsibility)</td>
</tr>
<tr>
<td></td>
<td>Laubinger, Sascha (Module counselling)</td>
</tr>
<tr>
<td></td>
<td>Albach, Dirk Carl (Module counselling)</td>
</tr>
<tr>
<td></td>
<td>Zotz, Gerhard Wolfgang (Authorized examiners)</td>
</tr>
<tr>
<td></td>
<td>Laubinger, Sascha (Authorized examiners)</td>
</tr>
<tr>
<td></td>
<td>Albach, Dirk Carl (Authorized examiners)</td>
</tr>
</tbody>
</table>

Responsible persons
- Zotz, Gerhard Wolfgang (Module responsibility)
- Laubinger, Sascha (Module counselling)
- Albach, Dirk Carl (Module counselling)
- Zotz, Gerhard Wolfgang (Authorized examiners)
- Laubinger, Sascha (Authorized examiners)
- Albach, Dirk Carl (Authorized examiners)

Prerequisites
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

Module level
- MM (Mastermodul / Master module)

Module capacity
- 12

Module form of teaching
- Wahlmodul / Opportunity

Lehr-/Lernform / Teaching/Learning method

Vorkenntnisse / Previous knowledge
- Ökologie, Flora, Genetik

Examination
- Time of examination
- Type of examination
- Final exam of module
- 1 term paper

Course type
- Seminar

SWS
- 4

Frequency
- WiSe

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

<table>
<thead>
<tr>
<th>Module label</th>
<th>Skills in Plant Systematics</th>
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<tbody>
<tr>
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<td>Workload</td>
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<td>Applicability of the module</td>
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<tr>
<td></td>
<td>Master's Programme Biology (Master) &gt; Skills Modules</td>
</tr>
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</table>

### Responsible persons

- Albach, Dirk Carl (Module responsibility)
- von Hagen, Klaus Bernhard (Module counselling)
- Albach, Dirk Carl (Authorized examiners)
- von Hagen, Klaus Bernhard (Authorized examiners)
- Janzen, Thijs (Authorized examiners)

### Prerequisites
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

**Languages of instruction**

- German, English

**Duration (semesters)**

- 1 Semester

**Module frequency**

- 8

**Modullevel / module level**

- MM (Mastermodul / Master module)

**Modulart / typ of module**

- Wahlmodul / Opportunity

**Lehr-/Lernform / Teaching/Learning method**

- gute Kenntnisse der heimischen Flora

**Vorkenntnisse / Previous knowledge**

**Examination**

- Time of examination
- Type of examination

<table>
<thead>
<tr>
<th>Final exam of module</th>
<th>1 presentation</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>1 report</td>
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</table>

<table>
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<tr>
<th>Course type</th>
<th>Comment</th>
<th>SWS</th>
<th>Frequency</th>
<th>Workload of compulsory attendance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seminar</td>
<td></td>
<td>2</td>
<td>WiSe</td>
<td>28</td>
</tr>
<tr>
<td>Exercises</td>
<td></td>
<td>2</td>
<td>WiSe</td>
<td>28</td>
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</table>

**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>
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<tr>
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<td>Workload</td>
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<tr>
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<td></td>
<td>Master's Programme Biology (Master) &gt; Skills Modules</td>
</tr>
<tr>
<td>Responsible persons</td>
<td>Gerlach, Gabriele (Module responsibility)</td>
</tr>
<tr>
<td></td>
<td>der Biologie, Lehrende (Module counselling)</td>
</tr>
<tr>
<td></td>
<td>Gerlach, Gabriele (Authorized examiners)</td>
</tr>
<tr>
<td></td>
<td>Laakmann, Silke (Authorized examiners)</td>
</tr>
</tbody>
</table>

**Prerequisites**

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

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

**Module contents**

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

**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

**Modullevel / module level**

MM (Mastermodul / Master module)

**Modulart / typ of module**

Wahlmodul / Opportunity

**Vorkenntnisse / Previous knowledge**

Teilnahme in einem oder mehreren Grundmodulen des Master Biologie

**Examination**

- Time of examination: open
- Type of examination: Portfolio

**Course type**

Seminar

**SWS**

2

**Frequency**

SoSe und WiSe

**Workload attendance**

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

<table>
<thead>
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<th>Biosciences in the Public Eye and in our Laws</th>
</tr>
</thead>
<tbody>
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</tr>
<tr>
<td>Credit points</td>
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</tr>
<tr>
<td>Workload</td>
<td>180 h</td>
</tr>
<tr>
<td></td>
<td>{ 56h contact / 84h research for presentations / 40h term paper }</td>
</tr>
</tbody>
</table>

#### Applicability of the module
- 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 Dutch Linguistics and Literary Studies (Bachelor) > Fachnahe Angebote Biologie
- Dual-Subject Bachelor's Programme Economic Education (Bachelor) > Fachnahe Angebote Biologie
- Dual-Subject Bachelor's Programme Economics and Business Administration (Bachelor) > Fachnahe Angebote Biologie
- Dual-Subject Bachelor's Programme Education (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
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- 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

#### Responsible persons
- Köppl, Christine (Module responsibility)
- Sienknecht, Ulrike (Module counselling)
- Köppl, Christine (Authorized examiners)
Sienknecht, Ulrike (Authorized examiners)

Prerequisites

Skills to be acquired in this module

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

Upon completion of this course, students

- know basic rules of good scientific practise
- are aware of the legal framework that is relevant to biological research, e.g. on animal welfare or genetically modified organisms
- have practised to research and summarize different viewpoints on biological research, using both scientific (peer-reviewed) and non-scientific sources
- are able to identify and critically discuss ethical conflicts in biological research, e.g., in the context of stem cell research or data manipulation
- are able to prepare and give a coherent presentation in a team
- have practised to lead a group discussion

Module contents

In supervised exercises, students research the ethical aspects and controversial issues on several specific topics in the biosciences. Everyone participates in researching all topics. Students then take turns in summarizing and presenting each topic in small teams, and leading a critical discussion of each topic. Problem-based, independent research of the scientific background by the students is an integral part of this module.

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

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

Reader's advisory

Links

Language of instruction

English

Duration (semesters)

1 Semester

Module frequency

annually, summer term

Module capacity

18

Modullevel / module level

MM (Mastermodul / Master module)

Modulart / typ of module

Wahlpflicht / Elective

Lehr-/Lernform / Teaching/Learning method

Vorkenntnisse / Previous knowledge

Fundamentals of genetics, physiology, ecology and biological systematics

Examination

Time of examination

within a few weeks of summer term lecture period

Type of examination

Term paper

Regular participation during the semester is required (max 3 days of absence)

Course type

Comment

SWS

Frequency

Workload of compulsory attendance

Lecture


Seminar and tutorial

4

SuSe

56

Total time of attendance for the module

56 h
### Module Information

**neu740 - Molecular Mechanisms of Ageing**

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

**Applicability of the module**

- 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
- Bachelor's Programme Programme Art and Media (Bachelor) > Fachnahe Angebote Biologie
- Bachelor's Programme Programme Biology (Bachelor) > Fachnahe Angebote Biologie
- Bachelor's Programme Programme Chemistry (Bachelor) > Fachnahe Angebote Biologie
- Bachelor's Programme Programme Computing Science (Bachelor) > Fachnahe Angebote Biologie
- Bachelor's Programme Programme Dutch Linguistics and Literary Studies (Bachelor) > Fachnahe Angebote Biologie
- Bachelor's Programme Programme Economic Education (Bachelor) > Fachnahe Angebote Biologie
- Bachelor's Programme Programme Economics and Business Administration (Bachelor) > Fachnahe Angebote Biologie
- Bachelor's Programme Programme Elementary Mathematics (Bachelor) > Fachnahe Angebote Biologie
- Bachelor's Programme Programme English Studies (Bachelor) > Fachnahe Angebote Biologie
- Bachelor's Programme Programme Gender Studies (Bachelor) > Fachnahe Angebote Biologie
- Bachelor's Programme Programme General Education (Bachelor) > Fachnahe Angebote Biologie
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- Bachelor's Programme Programme Material Culture: Textiles (Bachelor) > Fachnahe Angebote Biologie
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- Bachelor's Programme Pädagogisches Handeln in der Migrationsgesellschaft (Bachelor) > Fachnahe Angebote Biologie
- Bachelor's Programme Neuroscience (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

**Responsible persons**

Thedieck, Kathrin (Module responsibility)
Ebbers, Lena (Module responsibility)
Prerequisites

Skills to be acquired in this module

- Neurosci. knowlg.
- Exp. 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 ressentation 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 ageing, Garland Science

Altern: Zelluläre und molekulare Grundlagen, körpliche 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 / module level</th>
<th>Wahl / Elective</th>
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</thead>
<tbody>
<tr>
<td>Modulart / typ of module</td>
<td>Wahlpflicht / Elective</td>
</tr>
<tr>
<td>Lehr-/Lernform / Teaching/Learning method</td>
<td></td>
</tr>
<tr>
<td>Vorkenntnisse / Previous knowledge</td>
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<thead>
<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>
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<table>
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<tr>
<th>Course type</th>
<th>Comment</th>
<th>SWS</th>
<th>Frequency</th>
<th>Workload of compulsory attendance</th>
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<tbody>
<tr>
<td>Lecture</td>
<td></td>
<td>2</td>
<td>SuSe</td>
<td>28</td>
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<tr>
<td>Exercises</td>
<td></td>
<td>4</td>
<td>SuSe</td>
<td>56</td>
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</table>

Total time of attendance for the module 84 h
neu751 - Laboratory Animal Science

Module label | Laboratory Animal Science
Module code | neu751
Credit points | 3.0 KP

Workload
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

Applicability of the module
- Master's Programme Biology (Master) > Skills Modules
- Master's Programme Molecular Biomedicine (Master) > Skills Modules
- Master's Programme Neuroscience (Master) > Skills Modules

Responsible persons
- Köppl, Christine (Module responsibility)
- Köppl, Christine (Authorized examiners)
- Langemann, Ulrike (Authorized examiners)
- Nolte, Arne (Authorized examiners)
- Heyers, Dominik (Authorized examiners)
- Ebbers, Lena (Authorized examiners)
- Dedek, Karin (Authorized examiners)

Prerequisites
- none

Skills to be acquired in this module
- ++ Expt. Methods
- + Independent Research
- + Scient. Literature
- ++ Social skills
- ++ Interdiscipl, knowlg
- + Scientific English
- ++ Ethics

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

NOTE: These objectives aim to satisfy the requirements for EU directive A „Persons carrying out animal experiments” and EU directive D „Persons killing animals”.

Module contents
Background knowledge is taught using the third-party online platform "LAS Interactive" which concludes with a written exam that has to be passed before the practical part. Topics covered are:

- Legislation, ethics and the 3Rs
- Scientific integrity
- Data collection
- Basic biology of rodents, birds and fish
- Husbandry, and nutrition of rodents, birds and fish
- Animal Welfare
- Health monitoring
- Pain and distress
- Euthanasia

Practical procedures will first be demonstrated, important aspects will then be practiced under supervision by
every 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

<table>
<thead>
<tr>
<th>Reader's advisory</th>
<th>&quot;LAS interactive&quot; internet-based learning platform</th>
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<tbody>
<tr>
<td>Links</td>
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<tr>
<td>Language of instruction</td>
<td>English</td>
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<tr>
<td>Duration (semesters)</td>
<td>1 Semester</td>
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<tr>
<td>Module frequency</td>
<td>semester break, every semester</td>
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<td>Module capacity</td>
<td>10 (Registration procedure / selection criteria: StudIP, sequence of registration)</td>
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</table>

**Modullevel / module level**

je nach Studiengang Pflicht oder Wahlpflicht

**Lehr-/Lernform / Teaching/Learning method**

**Vorkenntnisse / Previous knowledge**

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<th>Examination</th>
<th>Time of examination</th>
<th>Type of examination</th>
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<tr>
<td>Final exam of module</td>
<td>immediately before the practical part</td>
<td>written exam of 90 minutes</td>
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<th>Frequency</th>
<th>Workload of compulsory attendance</th>
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<tr>
<td>Lecture</td>
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<td>Exercises</td>
<td>1</td>
<td>SoSe und WiSe</td>
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**Total time of attendance for the module**

28 h
neu760 - Scientific English

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**Workload**

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<th>Contact</th>
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<tr>
<td>0.5 SWS Lecture (VO)</td>
<td>8h</td>
<td>15h</td>
<td>23h</td>
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<tr>
<td>3.5 SWS Supervised exercise (UE)</td>
<td>46h</td>
<td>66h</td>
<td>158h</td>
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**Applicability of the module**

- Master's Programme Biology (Master) > Skills Modules
- Master's Programme Biology (Master) > Skills Modules
- Master's Programme Molecular Biomedicine (Master) > Skills Modules
- Master's Programme Neuroscience (Master) > Skills Modules

**Responsible persons**

- Köppl, Christine (Module responsibility)
- Hildebrandt, Jannis (Authorized examiners)
- Köppl, Christine (Authorized examiners)

**Prerequisites**

- non-native speakers

**Skills to be acquired in this module**

- + Neurosci. knowlg.
- ++ Social skills
- ++ Data present./disc.
- ++ Scientific English

Upon completion of this course, students

- have increased their proficiency in different forms of scientific presentation and communication in English, with special emphasis on neuroscience
- are able to express themselves with correct sentence structure and grammar, correct use of idioms and correct 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

**Reference text**

Usually held in the break before summer term

Outsourced to STELS-OL (Scientific and Technical English Language Service); native English speaker with in-depth neuroscience knowlg.

**Module level / module level**

je nach Studiengang Pflicht oder Wahlpflicht

**Moduleart / typ of module**

**Lehr-/Lernform / Teaching/Learning method**

minimum English level B2 (C1 preferred) according to Common European Framework of Reference for Languages (CEFR)

priority to non-native speakers, higher semester
<table>
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<th>Examination</th>
<th>Time of examination</th>
<th>Type of examination</th>
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<tr>
<td>Final exam of module</td>
<td>within 2 months of completing the course</td>
<td>Portfolio: 70% several quick tests, texts, presentations, 30% term paper</td>
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<td>Bonus system for active participation</td>
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<th>Comment</th>
<th>SWS</th>
<th>Frequency</th>
<th>Workload of compulsory attendance</th>
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<tr>
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<td>Exercises</td>
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<td>WiSe</td>
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**Total time of attendance for the module** 56 h
# neu780 - Introduction to Data Analysis with Python

<table>
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<th>Module label</th>
<th>Introduction to Data Analysis with Python</th>
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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</td>
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<tr>
<td></td>
<td>(2 SWS Lecture total workload 90h: 30h contact / 60h individual reading 2 SWS Supervised exercise total workload 90h: 45h contact / 45h solving programming exercises)</td>
</tr>
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</table>
| Applicability of the module | • Master's Programme Biology (Master) > Skills Modules  
                             • Master's Programme Biology (Master) > Skills Modules  
                             • Master's Programme Neuroscience (Master) > Skills Modules |
| Responsible persons   | Winklhofer, Michael (Module responsibility)  
                             Winklhofer, Michael (Authorized examiners) |
| Prerequisites         | + Neuroscience  
                             ++ Mathematics/Statistics/Programming  
                             + Data presentation/discussion |
| Skills to be acquired in this module | + Neuroscience  
                             ++ Mathematics/Statistics/Programming  
                             + Data presentation/discussion |
| The objective of the module is the acquisition of programming skills with focus on analysis of neurobiological datasets, using the programming language python. Python is available for any computer platform (PC, Mac, Linux) and is open source (for free), see [https://www.python.org/](https://www.python.org/). Students will learn how to write effective scripts for data processing and visualisation, making use of pre-existing program libraries for various generic purposes (maths, statistics, plotting, image analysis). Typical applications will be analysis of time series (e.g., electrophysiological recordings, movement data), images (e.g. immunohistochemical images, MRI slices), and spatio-temporal correlations in volume data. Students will also learn how to produce synthetica data from various noise models to assess signal-to-noise ratio in instrumental datasets. |
| Module contents       | Data types and data structures, control structures, functions, modules, file input/output Standard libraries and SciPy libraries (Matplotlib, NumPy,...), scikit-image, VPython, ... |
| Reader's advisory     | open access  
                             http://www.swaroopch.com/notes/python/  
                             http://docs.python.org/3/tutorial/index.html |
| Links                 |                                            |
| Language of instruction | English                                 |
| Duration (semesters)  | 1 Semester                                |
| Module frequency      | semester break, annually                  |
| Module capacity       | 20                                        |
| Reference text        | Shared course components with (cannot be credited twice): pb328 "Einführung in Datenanalyse mit Python" (Professionalisierungsmodul im Bachelorstudium Biologie) |
| Modullevel / module level | Wahlpflicht / Elective                   |
| Lehr-/Lernform / Teaching/Learning method |                                                   |
| Vorkenntnisse / Previous knowledge | No prior knowledge in programming required, but useful. |
| Examination           | Time of examination  
                             Type of examination |
| Final exam of module  | term break, immediately after the course (2 weeks in February)  
                             assignment of programming exercises, 4 out of 5 exercises to be assessed |
| Course type           | Comment  
                             SWS  
                             Frequency  
                             Workload of compulsory attendance |
| Lecture               | 2  
                             WiSe  
                             28 |
| Exercises             | 2  
                             WiSe  
                             28 |
| Total time of attendance for the module | 56 h |
neu790 - Communicating Neuroscience

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<tr>
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<tbody>
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<td>Module code</td>
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<tr>
<td>Credit points</td>
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<tr>
<td>Workload</td>
<td>90 h</td>
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<td></td>
<td>(28 h contact / 62 h individual reading and preparing discussion questions)</td>
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Applicability of the module
- Master's Programme Biology (Master) > Skills Modules
- Master's Programme Neuroscience (Master) > Skills Modules

Responsible persons
- Kretzberg, Jutta (Module responsibility)
- Kretzberg, Jutta (Authorized examiners)
- Köppl, Christine (Authorized examiners)

Prerequisites
- Neurosci. knowlg.
- Scient. Literature
- Social skills
- Interdiscipl. knowlg.
- Data present./disc.
- Scientific English
- Ethics

Upon successful completion of this course, students will have thought about and discussed in depth scientific, social and ethical aspects of communication in and about neuroscience. In particular, participants practice critical reading of neuroscience literature, learn about the scientific publication process and discuss science communication to the general public.

Module contents
The overall goal of critical discussion of neuroscientific results in a scientific, social and ethical context requires preparation and active participation both before (Stud.IP wiki) and during the weekly sessions. Each participant is responsible for the preparation and moderation of at least one session in a group of 2-3 students. For passing the module, additional active participation is required in at least 10 of the seminar sessions. The specific papers and topics that are discussed vary, but typically cover:
- How to find literature?
- How to read different types of scientific papers: Classic papers, review papers, perspective papers, recent original papers?
- Publication process, Authorship and impact metrics
- Alternative publication paths and data sharing in neuroscience
- Science communication for the general public and on social media
- Face-to-face scientific communication

Reader's advisory
List of published papers, as well as online resources for preparation will be selected by the teachers and participants and announced via Stud.IP.

Background neuroscience textbooks, e.g.:
- Galizia, Lledo ‘Neuroscience – From Molecule to Behavior’, 2013, Springer
- Nicholls et al. ‘From Neuron to Brain’, 5th edition 2012, Sinauer
Links

Related content: Science communication workshop:
https://elearning.uni-oldenburg.de/dispatch.php/course/overview?cid=6fc0dbba53d7b3f5e3680f52ac7df7

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<thead>
<tr>
<th>Language of instruction</th>
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<td>Duration (semesters)</td>
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<tr>
<td>Module frequency</td>
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<td>Moduleart / Typ of module</td>
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<td>WiSe</td>
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<td>Workload attendance</td>
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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

Applicability of the module
- Master's Programme Biology (Master) > Skills Modules
- Master's Programme Biology (Master) > Skills Modules
- Master's Programme Neuroscience (Master) > Skills Modules

Responsible persons
Gießing, Carsten (Module responsibility)
Gießing, Carsten (Authorized examiners)

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

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

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

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}

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

Modulart / typ of module
Wahlpflicht / Elective

Lehr-/Lernform / Teaching/Learning method

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 of compulsory attendance
Lecture

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<td>SuSe</td>
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<td>Exercises</td>
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<td>SuSe</td>
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Total time of attendance for the module
28 h
### neu810 - International Meeting Contribution

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<td>Applicability of the module</td>
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<td>Master's Programme Neuroscience (Master) &gt; Skills Modules</td>
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<tr>
<td>Responsible persons</td>
<td>Kretzberg, Jutta (Module responsibility)</td>
</tr>
<tr>
<td></td>
<td>Kretzberg, Jutta (Authorized examiners)</td>
</tr>
<tr>
<td></td>
<td>Köppl, Christine (Authorized examiners)</td>
</tr>
<tr>
<td>Prerequisites</td>
<td>+ Neurosci. knowlg.</td>
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<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>+ Interdiscipl. knowlg.</td>
</tr>
<tr>
<td></td>
<td>++ Data present./disc.</td>
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<td></td>
<td>+ Scientific English</td>
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<tr>
<td></td>
<td>+ Ethics</td>
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<tr>
<td>Skills to be acquired in this module</td>
<td>Preparation, presentation and critical discussion of own studies for an international audience:</td>
</tr>
<tr>
<td></td>
<td>• participate in an international meeting</td>
</tr>
<tr>
<td></td>
<td>• prepare a poster or talk for an international meeting</td>
</tr>
<tr>
<td></td>
<td>• present own results in a way that is appropriate for the target audience</td>
</tr>
<tr>
<td></td>
<td>• put own studies into the context of scientific literature</td>
</tr>
<tr>
<td></td>
<td>• acquire additional knowledge about a broader field of research</td>
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</table>

### Module contents

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

It is mandatory to present the poster or talk to Christine Köppl or Jutta Kretzberg prior to the meeting and incorporate the feedback on the presentation.

### Reader's advisory

-dependent on the scientific topic-

### Links

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<tr>
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<td>Module capacity</td>
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<td>Modulart / typ of module</td>
<td>Wahlpflicht / Elective</td>
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<tr>
<td>Lehr-/Lernform / Teaching/Learning method</td>
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### Vorkenntnisse / Previous knowledge

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<th>Type of examination</th>
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<td>presentation (ungraded, pass/fail)</td>
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<td>Seminar</td>
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<p>| SWS | 2 |</p>
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neu725 - Multivariate Statistics and Applications in R

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<td>Workload</td>
<td>180 h</td>
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<td></td>
<td>2 SWS Lecture (30h contact / 60h self-studies and exam preparation)</td>
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<td></td>
<td>2 SWS Seminar (30h contact / 60h statistical data analysis in R)</td>
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<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>Responsible persons</td>
<td>Hildebrandt, Andrea (Module responsibility)</td>
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<td>Hildebrandt, Andrea (Authorized examiners)</td>
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<td>Prerequisites</td>
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<td>Skills to be acquired in this module</td>
<td>Students will acquire basic knowledge in planning empirical investigations, managing and understanding quantitative data and conducting a wide variety of multivariate statistical analyses. They will learn how to use the statistical methodology in terms of good scientific practice and how to interpret, evaluate and synthesize empirical results from the perspective of statistical modeling in basic and applied research context. The courses in this module will additionally point out statistical misconceptions and help students to overcome them.</td>
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<tr>
<td></td>
<td>+ Independent research</td>
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<td>+ Scient. Literature</td>
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<td>+ Social skills</td>
</tr>
<tr>
<td></td>
<td>++ Interdiscipl. knowledge</td>
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<tr>
<td></td>
<td>++ Math/Stats/Progr.</td>
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<td>++ Data preset./disc.</td>
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<td></td>
<td>+ Scient. English</td>
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<tr>
<td></td>
<td>++ Ethics</td>
</tr>
<tr>
<td></td>
<td>Graphical representation of multivariate data</td>
</tr>
<tr>
<td></td>
<td>The Generalized Linear Modeling (GLM) framework</td>
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<tr>
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<td>Multiple and moderated linear regression with quantitative and qualitative predictors</td>
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<td>Logistic regression</td>
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<td>Multilevel regression (Generalized Linear Mixed Effects Modeling – GLMM)</td>
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<td>Non-linear regression models</td>
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<td>Path modeling</td>
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<td>Factor analysis (exploratory &amp; confirmatory)</td>
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<td></td>
<td>(Multilevel) Structural equation modeling (SEM linear and non-linear)</td>
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<td></td>
<td>Part 2: Analysis Methods with R (seminar)</td>
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<tr>
<td></td>
<td>Data examples and applications of GLM, GLMM, polynomial, spline and local regression, path modeling, factor analyses and SEM</td>
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<td>Course material will be available in Stud.IP</td>
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neu820 - Neuroscience Journal Club

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<td>Workload</td>
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<td>(30h contact / 60h reading and preparation of oral and poster presentation)</td>
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<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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<td>Responsible persons</td>
<td>Mertsch, Sonja (Module responsibility)</td>
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<td>Mertsch, Sonja (Authorized examiners)</td>
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<td>Prerequisites</td>
<td>Students will learn to read, interpret, present and discuss neuroscientific literature.</td>
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<tr>
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<td>++ Neurosci. knowledge</td>
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<td>+ Expt. Methods</td>
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<td>++ Scient. Literature</td>
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<td>++ Social skills</td>
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<td>+ Interdiscipl. knowledge</td>
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<td>++ Data present./disc.</td>
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<td>+ Ethics</td>
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<td>Week 1: How to read and present a scientific paper and how to generate a scientific poster? Distribution of papers to participants</td>
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<td>Week 2: Example presentation of a scientific paper by the teacher with discussion</td>
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<td>Week 3-13: Oral presentation / moderation of discussion of one scientific paper per week by one or two student(s)</td>
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<td>Week 14: Short poster presentations of all students</td>
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<td>The focus topic of the scientific literature will change between semesters. In winter semester 2021/22, the topic will be regenerative ophthalmology with the focus on tissue engineering.</td>
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<td>Scientific literature will be available in Stud.IP</td>
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<td>presentation and attendance of at least 70% in the seminars</td>
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<td>WiSe</td>
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bio777 · Objekte in wissenschaftlichen Sammlungen: Konservierung, Management und Forschungsfragen

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<th>Objekte in wissenschaftlichen Sammlungen: Konservierung, Management und Forschungsfragen</th>
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<td>Workload</td>
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| Applicability of the module | - Master's Programme Biology (Master) > Skills Modules  
- Master's Programme Biology (Master) > Skills Modules |
| Responsible persons | Will, Maria (Module responsibility)  
Ellwanger, Karen (Module counselling)  
Krämer, Carolin (Module counselling)  
Albach, Dirk Carl (Module counselling)  
Will, Maria (Authorized examiners)  
Ellwanger, Karen (Authorized examiners)  
Krämer, Carolin (Authorized examiners) |
| Prerequisites | - deepened biological expertise  
- deepened knowledge of biological working methods  
- interdisciplinary thinking  
- critical and analytical thinking  
- independent searching and knowledge of scientific literature  
- ability to perform independent biological research  
- data presentation and discussion in German and English (written and spoken)  
- teamwork  
- ethics and professional behaviour  
- project and time management |
| Module contents | - history of collections at universities and their importance for developing scientific theories;  
- origin/formation of collections (objects in time and space)  
- the collections of the CvO (overview) and their importance as infrastructure for teaching, learning and research  
- collection work in biological collections such as botanical garden, natural history museums, didactic collections or the herbarium (concepts, object handling, conservation, documentation & digitalization)  
- developing research questions and projects based on objects/collections, e.g., provenance research  
- communicating object-based topics (e.g., speed talk presenting current scientific articles)  
- … |
| Reader's advisory | articles and book chapters referring to (1) the history/presence/future of collections, (2) collection management and (3) research projects based on objects/collections |
| Links | https://uol.de/kustodien/zertifikatsprogramm |
| Languages of instruction | German, English |
| Duration (semesters) | 1 Semester |
| Module frequency | 64 / 69 |
Module capacity

10 (Vorlesung & Seminar als transdisziplinäre LV in Kooperation mit Fak. III)

Reference text

verknüpft mit dem Modul bio783 "Object-based Research Projects in Biological Collections" (unabhängig Belegung möglich).

Wegen inhaltlicher Überschneidungen kann das Modul nicht zusätzlich zu pb335 belegt werden.

Module level / module level

MM (Mastermodul / Master module)

Modulart / typ of module

Wahlmodul / Opportunity

Learning method

Vorkenntnisse / Previous knowledge

Examination

Type of examination

Final exam of module

2 Prüfungsleistungen:
- 1 Klausur oder 1 mündliche Prüfung (100%)
- 1 Fachpraktische Übung (unbenotet)

Course type

Comment

SWS

Frequency

Workload of compulsory attendance

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<th>Comment</th>
<th>SWS</th>
<th>Frequency</th>
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<td>Exercises</td>
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<td>1</td>
<td>WiSe</td>
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Total time of attendance for the module

56 h
bio783 - Object-based Research Projects in Biological Collections

Module label: Object-based Research Projects in Biological Collections

Module code: bio783

Credit points: 6.0 KP

Workload: 180 h

Applicability of the module:
- Master's Programme Biology (Master) > Skills Modules
- Master's Programme Biology (Master) > Skills Modules

Responsible persons:
Will, Maria (Module responsibility)
Albach, Dirk Carl (Module counselling)
Will, Maria (Authorized examiners)

Prerequisites

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

Module contents:
- documentation of a natural history collection (e.g., university or from an herbarium) including a description of the object(s), digitalization, check for traces of use and/or damage;
- if needed: restauration, i.e. fixing loose plants on herbarium vouchers;
- trace biographies of the collector and the collection/object (provenance);
- trace comparable collections using databases;
- as far as possible: identification/validation of scientific identification using databases and scientific literature
- generating and answer scientific questions based on the collection or develop an educational approach (e.g., teaching lecture)
- communicate the results, i.e. prepare a poster for a congress and defend your theses and summarize the results in a manuscripts;
...

Reader's advisory:
scientific literature corresponding to the individual research project

Links

Languages of instruction: German, English

Duration (semesters): 1 Semester

Module frequency: irregular

Module capacity: 4

Reference text:

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

Modularit / typ of module: Wahlmodul / Opportunity

Lehr-/Lernform / Teaching/Learning
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**Vorkenntnisse / Previous knowledge**

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<th>Type of examination</th>
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<tbody>
<tr>
<td>Final exam of module</td>
<td>individual</td>
<td>1 Portfolio</td>
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</tbody>
</table>

**Course type**

| Exercises |

**SWS**

| 4 |

**Frequency**

| WiSe |

**Workload attendance**

| 56 h |
Abschlussmodul

mam - Master’s Thesis Module

<table>
<thead>
<tr>
<th>Module label</th>
<th>Master’s Thesis Module</th>
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<tbody>
<tr>
<td>Module code</td>
<td>mam</td>
</tr>
<tr>
<td>Credit points</td>
<td>30.0 KP</td>
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<tr>
<td>Workload</td>
<td>900 h</td>
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<tr>
<td>Applicability of the module</td>
<td>Master’s Programme Biology (Master) &gt; Abschlussmodul</td>
</tr>
<tr>
<td>Responsible persons</td>
<td>der Biologie, Lehrende (Authorized examiners)</td>
</tr>
<tr>
<td>Prerequisites</td>
<td></td>
</tr>
<tr>
<td>Skills to be acquired in this module</td>
<td>Successful completion of the Master module demonstrates that students are able to work on a problem in the field of Biology within a fixed period applying scientific methods.</td>
</tr>
<tr>
<td></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>
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<tr>
<td></td>
<td>++ independent searching and knowledge of scientific literature</td>
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<td></td>
<td>++ ability to perform independent biological research</td>
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<tr>
<td></td>
<td>++ data presentation and discussion in German and English (written and spoken)</td>
</tr>
<tr>
<td></td>
<td>++ teamwork</td>
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<tr>
<td></td>
<td>++ ethics and professional behaviour</td>
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<tr>
<td></td>
<td>++ project and time management</td>
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<tr>
<td>Module contents</td>
<td>Preparing the Master thesis</td>
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<td></td>
<td>Active participation in the seminar of the research group, in which the Master thesis is written</td>
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<tr>
<td>Reader’s advisory</td>
<td>Supervisors may supply an initial reading list with important literature. The students are expected to find and use further literature as needed.</td>
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<tr>
<td>Links</td>
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<td>Languages of instruction</td>
<td>English, German</td>
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<td>Duration (semesters)</td>
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<td>Module frequency</td>
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<tr>
<td>Module capacity</td>
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<tr>
<td>Module level / module level</td>
<td>MM (Mastermodul / Master module)</td>
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<td>Pflicht / Mandatory</td>
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<td>Lehr-/Lernform / Teaching/Learning method</td>
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<td>Vorkenntnisse / Previous knowledge</td>
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<td>Examination</td>
<td>Time of examination</td>
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<td>SoSe und WiSe</td>
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<tr>
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