# Modules for Biology

## Basismodule

### bio210 - General Biology

<table>
<thead>
<tr>
<th>Module label</th>
<th>General Biology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Module code</td>
<td>bio210</td>
</tr>
<tr>
<td>Credit points</td>
<td>12.0 KP</td>
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<tr>
<td>Workload</td>
<td>360 h</td>
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*Used in course of study*
- Fach-Bachelor Biologie > Basismodule
- Fach-Bachelor Mathematik > Nebenfachmodule
- Zwei-Fächer-Bachelor Biologie > Basismodule

**Contact person**

- Module responsibility: Gabriele Gerlach
- Authorized examiners:
  - Gabriele Gerlach
  - Gerhard Wolfgang Zotz
- Module counseling: Gerhard Wolfgang Zotz

**Entry requirements**

**Skills to be acquired in this module**

++ biological knowledge
+ knowledge of biological working methods
++ biologically relevant knowledge in the natural sciences and mathematics
+ interdisciplinary knowledge & thinking

The students are enabled:

- to understand and explain the fundamentals of the subjects dealt with in "Purves" or "Campbell" and to give examples,
- to find the role of biology in other special fields according to their inclinations and abilities,
- to reflect upon the role of biology in other special fields and in a modern society,
- to approach their individual planning of studies according to their inclinations and abilities

**Module contents**
The lecture imparts the basic knowledge of biology and covers the subjects dealt with in the textbooks "Purves" or "Campbell"

**Reader's advisory**
Purves, Spektrum Verlag, latest edition
Campbell, Pearson Verlag, latest edition

**Links**

- **Language of instruction**: German
- **Duration (semesters)**: 2 Semester
- **Module frequency**: jährlich
- **Module capacity**: unlimited
- **Modullevel**: ---
- **Modulart**: je nach Studiengang Pflicht oder Wahlpflicht

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

**Vorkenntnisse / Previous knowledge**

**Examination**

<table>
<thead>
<tr>
<th>Time of examination</th>
<th>Type of examination</th>
</tr>
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<tbody>
<tr>
<td>Written examination either in the final week of the semester or in the first week of the semester vacation</td>
<td>One written examination in the winter and summer terms (50 % each)</td>
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**PLEASE NOTE:**

Additional conditions regarding attendance and ungraded activities as determined by the persons responsible for the module will apply.

**Course type**

<table>
<thead>
<tr>
<th>Comment</th>
<th>SWS</th>
<th>Frequency</th>
<th>Workload attendance</th>
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<tr>
<td>Lecture</td>
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<td></td>
<td>112 h</td>
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<td>Course type</td>
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<td>Frequency</td>
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<td>-------------</td>
<td>---------</td>
<td>-----</td>
<td>-----------</td>
</tr>
<tr>
<td>Tutorial</td>
<td></td>
<td>0.00</td>
<td>WiSe</td>
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<tr>
<td>Seminar</td>
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<td>SuSe and WiSe</td>
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**Total time of attendance for the module**  
112 h
**Module Information**

**Module Code**: bio215

**Credit Points**: 9.0 KP

**Workload**: 270 h

**Used in Course of Study**:
- Fach-Bachelor Biologie > Basismodule
- Fach-Bachelor Mathematik > Nebenfachmodule
- Zwei-Fächer-Bachelor Biologie > Basismodule

**Contact Person**
- Module Responsibility:
  - Gabriele Gerlach
  - Christine Köppl
- Authorized Examiners:
  - Gabriele Gerlach
  - Christine Köppl
  - Gerhard Wolfgang Zotz
  - Ulrike Sienknecht

**Module Counseling**
- Gerhard Wolfgang Zotz
- Ulrike Sienknecht

**Entry Requirements**

**Skills to be Acquired in this Module**
- ++ biological knowledge
- + knowledge of techniques in biology
- ++ biologically relevant knowledge in the natural sciences and mathematics
- + cross-disciplinary knowledge and thinking

**Module Contents**
- Lecture conveys knowledge in
  - evolution, ecology and biodiversity (WiSe)
  - animal physiology and developmental biology (SoSe)

**Reader's Advisory**
- Campbell et al. "Biologie", Pearson
- Sadava et al. "Purves, Biologie", Springer

**Links**
- Language of Instruction: German
- Duration (Semesters): 2 Semester
- Module Frequency
- Module Capacity: 300
- Modullevel: BC (Basicscurriculum / Base curriculum)
- Modulart: Pflicht / Mandatory

**Lern-/Lehrform / Type of Program**
- Lecture

**Vorkenntnisse / Previous Knowledge**

**Examination / Time of Examination**

<table>
<thead>
<tr>
<th>Final exam of module</th>
<th>Time of examination</th>
<th>Type of Examination</th>
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<tbody>
<tr>
<td>lecture-free periods after each series</td>
<td>2 written examinations (WiSe and SoSe)</td>
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**Course Type**

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<thead>
<tr>
<th>Course Type</th>
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<tr>
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<td>Seminar</td>
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<td>WiSe</td>
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<tr>
<td>Tutorial</td>
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<td>0 h</td>
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**Total Time of Attendance for the Module**: 84 h
bio220 - Introductory Zoology-Botany

Module label: Introductory Zoology-Botany
Module code: bio220
Credit points: 9.0 KP
Workload: 270 h
Used in course of study:
- Fach-Bachelor Biologie > Basismodule
- Zwei-Fächer-Bachelor Biologie > Basismodule

Contact person
Module responsibility:
- Gerhard Wolfgang Zotz
- Olaf Bininda-Emonds

Authorized examiners:
- Wilko Ahlrichs
- Olaf Bininda-Emonds
- Thomas Glatzel
- Gerhard Wolfgang Zotz

Module counseling:
- Wilko Ahlrichs
- Thomas Glatzel

Entry requirements
Skills to be acquired in this module:
++ biological knowledge
+ knowledge of biological working methods
++ biologically relevant knowledge in the natural sciences and mathematics
+ abstract, logical, analytical thinking
+ independent learning and (research-based) working
+ teamwork

THEORY:
* To understand the fundamentals of reconstructing phylogenetic relationships
* To know the phylogenetic system and ground pattern of high-ranking ancestral animal species
* To know the cell structures, organization, and reproduction of plants and animals
* To know the morphology and anatomy of individual species

PRACTICE:
* To improve and verify the theoretical knowledge acquired from lectures and textbooks by studying the original
* To train visual and tactile perception by studying various species
* To learn that representations in textbooks are abstractions of a much more complex reality
* To be able to criticize representations in textbooks and models
* To acquire the knowledge of the function in living animals and plants by studying preserved specimens
* Learning how to follow preparation instructions
* Learning that the organization of individual species may be highly variable
* Preparing records or drawings from the information obtained by original specimens studied

Module contents
GENERAL: Light microscopic methods are applied to study structures in plants and animals. Records in the form of descriptions and drawings.

BOTANY: Morphological structure and reproduction of various plant organization types with a focus on the structure of plant tissue. Representation of the relationships between structure and function with regard to absorption processes, transport processes, transpiration, and photosynthesis.


Reader's advisory
GENERAL: Campbell: Biologie (Spektrum Verlag) or Purves: Biologie (Spektrum Verlag), latest edition


Links

Language of instruction German

Duration (semesters) 1 Semester

Module frequency jährlich

Module capacity unlimited

Modullevel BC (Basiscurriculum / Base curriculum)

Modulart Pflicht / Mandatory

Lern-/Lehrform / Type of program

Vorkenntnisse / Previous knowledge

Examination Time of examination Type of examination

Final exam of module Written examination in the final week of the current part 1 written examination (50%) following the part Zoology
1 written examination (50%) following the part Botany;
voluntary bonus (10%) in the second part (botany)

PLEASE NOTE: Additional conditions regarding attendance and ungraded activities as determined by the persons responsible for the module will apply.

Course type Comment SWS Frequency Workload attendance

Lecture 2.00 WiSe 28 h
Exercises 4.00 56 h
Tutorial 0.00 0 h

Total time of attendance for the module 84 h
bio233 - Basics in Microbiology and Genetics

Module label | Basics in Microbiology and Genetics
---|---
Module code | bio233
Credit points | 6.0 KP
Workload | 180 h

Used in course of study
- Fach-Bachelor Biologie > Basismodule
- Zwei-Fächer-Bachelor Biologie > Basismodule

Contact person
- Module responsibility
  - Ralf Andreas Rabus
  - Authorized examiners
    - Ralf Andreas Rabus
    - Maike Claußen
  - Module counseling
    - Maike Claußen

Entry requirements

Skills to be acquired in this module
- ++ biological knowledge
- + knowledge of biological working methods
- + biologically relevant knowledge in the natural sciences and mathematics
- + deepened expertise in biological specialist field
- + independent learning and (research-based) working

Module contents

Reader's advisory

Links

Language of instruction | German
Duration (semesters) | 1 Semester

Module frequency | unlimited
Module capacity | unlimited
Modullevel | BC (Basiscurrkiem / Base curriculum)

Lern-/Lehrform / Type of program

Vorkenntnisse / Previous knowledge

Examination | Time of examination | Type of examination
---|---|---
Final exam of module

Course type | Comment | SWS | Frequency | Workload attendance
---|---|---|---|---
Lecture | | 4.00 | SuSe or WiSe | 56 h
Tutorial | | 0.00 | SuSe and WiSe | 0 h

Total time of attendance for the module | 56 h
### bio236 - Basics in Biochemistry and Cell Biology

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<th>Module label</th>
<th>Basics in Biochemistry and Cell Biology</th>
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<tr>
<td>Module code</td>
<td>bio236</td>
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<tr>
<td>Credit points</td>
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<td>Workload</td>
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<td>Used in course of study</td>
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<td></td>
<td>• Fach-Bachelor Biologie &gt; Basismodule</td>
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<td>• Zwei-Fächer-Bachelor Biologie &gt; Basismodule</td>
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<td>Contact person</td>
<td>Module responsibility</td>
</tr>
<tr>
<td></td>
<td>• Karl-Wilhelm Koch</td>
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<tr>
<td></td>
<td>Authorized examiners</td>
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<td></td>
<td>• Karl-Wilhelm Koch</td>
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<tr>
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<td>• Michael Winkhofer</td>
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<td>Module counseling</td>
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<tr>
<td></td>
<td>• Michael Winkhofer</td>
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<td>Entry requirements</td>
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<tr>
<td>Skills to be acquired in this module</td>
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<tr>
<td></td>
<td>++ biological knowledge</td>
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<tr>
<td></td>
<td>+ knowledge of biological working methods</td>
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<td></td>
<td>++ biologically relevant knowledge in the natural sciences and mathematics</td>
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<td></td>
<td>+ abstract, logical, analytical thinking</td>
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<tr>
<td>Module contents</td>
<td>Introduction to structure and function of main biochemical building blocks; amino acids, carbohydrates, proteins, nucleic acids, introduction to metabolism; biological membranes and transmembrane transport; structure and function of cell organelles; protein synthesis and posttranslational modification, intracellular transport and trafficking, signalling agents and cellular communication, cell division, controlled cell death</td>
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<tr>
<td>Reader's advisory</td>
<td>Biochemie, Müller-Esterl</td>
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<td></td>
<td>Stryer Biochemie, Berg, Tymoczko, Stryer</td>
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<td></td>
<td>Lehninger Prinzipien der Biochemie, David L. Nelson und Michael M. Cox</td>
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<td>Principles of Biochemistry, Horton et al.</td>
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<td>Zellbiologie, Helmut Plattner und Joachim Hentschel</td>
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<td>Molekulare Zellbiologie, Gerald Karp</td>
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<td>Molekularbiologie der Zelle, Bruce Alberts</td>
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<td>Modulart</td>
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<td>Lern-/Lehrform / Type of program</td>
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<td>Vorkenntnisse / Previous knowledge</td>
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<tr>
<td>Examination</td>
<td>Type of examination</td>
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<td>Time of examination</td>
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<td>WS e</td>
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<td>Workload attendance</td>
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bio230 - Microbiology and Cell Biology

Module label: Microbiology and Cell Biology

Module code: bio230

Credit points: 9.0 KP

Workload: 270 h

Used in course of study:
- Fach-Bachelor Biologie > Basismodule
- Zwei-Fächer-Bachelor Biologie > Basismodule

Contact person:
Module responsibility: Ralf Andreas Rabus
Authorized examiners: Ralf Andreas Rabus, Hans Gerd Nothwang, Maike Claußen
Module counseling: Maike Claußen

Entry requirements:
Skills to be acquired in this module:
- ++ biological knowledge
- ++ knowledge of biological working methods
- + biologically relevant knowledge in the natural sciences and mathematics
- + abstract, logical, analytical thinking
- + deepened expertise in biological specialist field
- + teamwork

Theory: Basic knowledge in Biochemistry, Microbiology, Cell Biology and Genetics
Practice: Basic methodological skills acquired by performing experiments

Module contents:
Fundamentals of Microbiology and Cell Biology:
- Molecules of life; energy and enzymes; central metabolism; breathing; photosynthesis; anaerobic metabolism; chemolithotrophy; procaryotic and eucaryotic cell structures; microbial diversity; importance of microorganisms for human beings, plants, animals, biotechnology and earth system
- cell group; signal transmission and communication between cells; meiosis; mitosis; mendelian inheritance; chromosomal and molecular basis of inheritance; replication; transcription; translation; genomic organization; mutation and repair.

Reader's advisory:
- Purves et al., Biologie (Spektrum Verlag), latest edition
- Campbell, Pearson Verlag, latest edition
- Fuchs, Allgemeine Mikrobiologie (Thieme Verlag), latest edition
- Lodisch et al., Molekulare Zellbiologie (Spektrum Verlag), latest edition

Links:
- Language of instruction: German
- Duration (semesters): 1 Semester
- Module frequency: jährlich
- Module capacity: unlimited
- Modullevel: BC (Basiscurriculum / Base curriculum)
- Modulart: Pflicht / Mandatory

Lern-/Lehrform / Type of program

Vorkenntnisse / Previous knowledge

Examination | Time of examination | Type of examination
---|---|---
Final exam of module | Written examination in the final week of the current part | 1 written examination (50%) following the part Microbiology
1 written examination (50%) following the part Cell Biology
Records are collected following every course day.

PLEASE NOTE:
- Additional conditions regarding attendance and ungraded activities as determined by the persons responsible for the module will apply

Course type | Comment | SWS | Frequency | Workload attendance
---|---|---|---|---

8 / 85
<table>
<thead>
<tr>
<th>Course type</th>
<th>Comment</th>
<th>SWS</th>
<th>Frequency</th>
<th>Workload attendance</th>
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<tbody>
<tr>
<td>Lecture</td>
<td></td>
<td>4.00</td>
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<td>Exercises</td>
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<td>2.00</td>
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<td>28 h</td>
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**Total time of attendance for the module** 84 h
Aufbaumodule

bio255 - Basics in Biochemistry and Cell Biology

Module label | Basics in Biochemistry and Cell Biology
Module code | bio255
Credit points | 9.0 KP
Workload | 270 h

Used in course of study
- Fach-Bachelor Biologie > Aufbaumodule
- Zwei-Fächer-Bachelor Biologie > Aufbaumodule

Contact person
Module responsibility
- Arne Nolte
Authorized examiners
- Arne Nolte

Entry requirements

Skills to be acquired in this module
++ biological knowledge
++ knowledge of biological working methods
++ biologically relevant knowledge in the natural sciences and mathematics
+ statistics & scientific programming
++ interdisciplinary knowledge & thinking
++ abstract, logical, analytical thinking
++ deepened expertise in biological specialist field

The field of molecular ecology examines relationships among genotypes, phenotypes and the environment to explain evolution and diversity of organisms. The lecture will introduce basics in genomics, molecular evolution and population genetics to explore properties of the genome and the organism from an evolutionary perspective. Central aspects are the adaptation of species to their environment and ecological change, speciation, the genetic basis of phenotypic change. Methods and data used in genomics and molecular ecology will be introduced during the lecture and exercises.

Module contents
Lecture: the lecture conveys knowledge about the fields of genomics, evolution and organismic biology. Moreover laboratory methods as well as basics and background information on the analysis of genetic and genomic datasets are given.

Exercises: Modern data sets and up to date methods in genomics and population genetics are introduced. The practical emphasizes computer based data analyses.

Reader's advisory

Links

Language of instruction | German
Duration (semesters) | 1 Semester

Module frequency
Module capacity | 30
Modullevel | AC (Aufbaucurriculum / Composition)
Modulart | Wahlpflicht / Elective

Lern-/Lehrform / Type of program
lecture, exercise

Vorkenntnisse / Previous knowledge

Examination | Time of examination | Type of examination
Final exam of module | exam

Course type | Comment | SWS | Frequency | Workload attendance
Lecture | 1.50 | WiSe | 21 h
Exercises | 4.50 | WiSe | 63 h

Total time of attendance for the module | 84 h
bio256 - Form and Identification - Flora and Fauna

<table>
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<th>Form and Identification - Flora and Fauna</th>
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<tbody>
<tr>
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<tr>
<td>Workload</td>
<td>360 h</td>
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<tr>
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<td>Fach-Bachelor Biologie &gt; Aufbaumodule</td>
</tr>
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</table>

**Contact person**

- Dirk Carl Albach
- Thomas Glatzel
- Maria Will
- Rolf Niedringhaus
- Klaus Bernhard von Hagen
- Frank Henrik Donat

**Module responsibility**

- Dirk Carl Albach
- Thomas Glatzel
- Maria Will
- Rolf Niedringhaus
- Klaus Bernhard von Hagen
- Frank Henrik Donat

**Entry requirements**

**Skills to be acquired in this module**

- biological knowledge
- knowledge of biological working methods
- independent learning and (research-based) working
- knowledge of safety and environmental issues

The module conveys the basic knowledge in animal and plant identification and their diversity. This is essential for all parts of biology concerned with plants and animals. Especially, education for the field of conservation and schools rely on these expertise. Therefore, topics and methods relevant for these professions are emphasized. Students shall get a basic knowledge of species and learn methods to identify them. This is connected with a systemic knowledge of habitats in Northwestern Germany. Basic evaluation competence in the field of biodiversity, species diversity and conservation is conveyed to sensitize students for a respectful treatment of organisms.

**Module contents**

- L: Introduction to the diversity of native flora and fauna, presentation of important plant and animal groups, introduction to systematics and major traits, ecological perspectives of species diversity
- EXE: Working with identification keys for plants and animals and their classification
- EXC: Excursion to characteristic habitats of Northwestern Germany, practicing work with field guides and identification of important traits

**Reader's advisory**

- Botany:
  - Rothmaler - Exkursionsflora von Deutschland, Band 2 - Grundband, Spektrum Akademischer Verlag
- Zoology:
  - M. Schaefer: Brohmer - Fauna von Deutschland, ab 20. Auflage
  - B. Klausnitzer: Stresemann - Exkursionsfauna von Deutschland. Band 1: Wirbellose (ohne Insekten)

**Links**

<table>
<thead>
<tr>
<th>Language of instruction</th>
<th>German</th>
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<tbody>
<tr>
<td>Duration (semesters)</td>
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**Module frequency**

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<tr>
<td>Modulart</td>
<td>Pflicht / Mandatory</td>
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<tr>
<td>Type of program</td>
<td>lecture, exercise, excursion</td>
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**Vorkenntnisse / Previous knowledge**

**Examination**

<table>
<thead>
<tr>
<th>Type of examination</th>
<th>Time of examination</th>
</tr>
</thead>
<tbody>
<tr>
<td>exams at the end of the semester</td>
<td>exams at the end of the semester</td>
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</table>

**Final exam of module**

<table>
<thead>
<tr>
<th>Type of examination</th>
<th>Time of examination</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 written exam (botany) 50%, 1 written exam (zoology) 50%, excursion protocols (ungraded), additional requirements regarding presence and ungraded activities as specified by docents responsible for the module</td>
<td>exams at the end of the semester</td>
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<td>Course type</td>
<td>Comment</td>
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<tr>
<td>--------------</td>
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<tr>
<td>Lecture</td>
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<tr>
<td>Exercises</td>
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</tr>
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<td>Study trip</td>
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**Total time of attendance for the module** 112 h
**bio265 - General Microbiology**

<table>
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<tr>
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<tbody>
<tr>
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<td>270 h</td>
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<td></td>
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</table>
  - Fach-Bachelor Biologie > Aufbaumodule  
  - Fach-Bachelor Umweltwissenschaften > Wahlpflichtmodule  
  - Zwei-Fächer-Bachelor Biologie > Aufbaumodule  |
| Contact person     | Module responsibility  
  - Ralf Andreas Rabus  
  - Erhard Rhiel  
  - Lars Wöhlbrand  |
| Authorized examiners |  
  - Ralf Andreas Rabus  
  - Erhard Rhiel  
  - Lars Wöhlbrand  |
| Module counseling  | Erhard Rhiel  
  - Lars Wöhlbrand  |
| Entry requirements | Basic knowledge of microbiology; ability to assess and apply fundamental microbiological techniques. |
| Skills to be acquired in this module |  |
| Module contents    | Imparting basic microbiological skills and working methods: Chemistry and structure of the cell, fundamentals of metabolism, taxonomy and phylogeny of microorganisms, diversity of microorganisms, insight into Applied Microbiology, propagation of microorganisms. |
| Reader's advisory  | Allgemeine Mikrobiologie, Schlegel 1992; Brock-Biology of Microorganisms, eds.: Madigan et al., 2003; Grundlagen der Mikrobiologie, Cypionka, 2003 |
| Links              |  |
| Language of instruction | German |
| Duration (semesters) | 1 Semester |
| Module frequency   | jährlich |
| Module capacity    | unlimited |
| Modulelevel        | AC (Aufbaucurriculum) |
| Modulart           | Wahlpflicht |
| Lern-/Lehrform / Type of program |  |
| Vorkenntnisse / Previous knowledge |  |
| Examination        | Time of examination   |
| Final exam of module | Type of examination 1 written examination |
| PLEASE NOTE:  
  Additional conditions regarding attendance and ungraded activities as determined by the persons responsible for the module will apply. |

<table>
<thead>
<tr>
<th>Course type</th>
<th>Comment</th>
<th>SWS</th>
<th>Frequency</th>
<th>Workload attendance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecture</td>
<td></td>
<td>2.00</td>
<td>WiSe</td>
<td>28 h</td>
</tr>
<tr>
<td>Seminar</td>
<td></td>
<td>1.00</td>
<td>WiSe</td>
<td>14 h</td>
</tr>
<tr>
<td>Practical</td>
<td></td>
<td>4.00</td>
<td>WiSe</td>
<td>56 h</td>
</tr>
<tr>
<td>Total time of attendance for the module</td>
<td>98 h</td>
<td></td>
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</table>
bio275 - Basics in Physiology

Module label | Basics in Physiology
---|---
Module code | bio275
Credit points | 9.0 KP
Workload | 270 h
Used in course of study | Fach-Bachelor Biologie > Aufbaumodule
| Fach-Bachelor Mathematik > Nebenfachmodule
| Zwei-Fächer-Bachelor Biologie > Aufbaumodule
Contact person | Module responsibility
| Dominik Heyers
Authorized examiners | Dominik Heyers
| Christine Köppl
| Karin Dedek
Module counseling | Christine Köppl
| Karin Dedek
Entry requirements
Skills to be acquired in this module
++ biological knowledge
++ knowledge of biological working methods
+ biologically relevant knowledge in the natural sciences and mathematics
+ statistics & scientific programming
++ abstract, logical, analytical thinking
+ deepened expertise in biological specialist field
++ independent learning and (research-based) working
+ teamwork

Basic knowledge on physiological processes and their underlying mechanisms with a focus on human physiology. Designing, performing, documenting and analysing physiological experiments; troubleshooting, basic statistics, "experimental thinking".

Module contents
The lecture covers topics such as cell physiology, sensory physiology, neurophysiology, functions of the vegetative system, blood physiology/immune response, blood cycle, respiration and digestion. Emphasis will be on human physiology. In the following lab exercises, students get the opportunity to perform physiological experiments linking to topics from the lecture. By performing experiments on themselves and computer simulations students will gain insight into the underlying physiological principles.

Reader's advisory
Klinke, Pape, Kurtz, Silbernagl: Physiologie, Aufl. 4, 2014
Schmidt, Lang, Heckmann: Physiologie des Menschen mit Pathophysiologie, Aufl. 31, 2011
Wehner, Gehring: Zoologie, Aufl. 25, 2013

Links
Language of instruction | German
Duration (semesters) | 1 Semester
Module frequency | jährlich
Module capacity | 144
Modullevel | AC (Aufbaucurriculum / Composition)
Modulart | Wahlpflicht / Elective
Lern-Lehrform / Type of program | lecture, exercise
Vorkenntnisse / Previous knowledge

<table>
<thead>
<tr>
<th>Examination</th>
<th>Time of examination</th>
<th>Type of examination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Final exam of module</td>
<td>within a few weeks after the winter term lecture period</td>
<td>written exam (100%)</td>
</tr>
</tbody>
</table>

Written protocols and active participation in the lab exercises. A cumulative bonus can be obtained with good lab protocols. The decision whether a given protocol deserves the bonus lies with the respective supervisor of each experiment. An exam mark of 1.0 is achievable without a bonus. A bonus cannot be applied to pass a failed exam.

Course type | Comment | SWS | Frequency | Workload attendance
---|---|---|---|---

<table>
<thead>
<tr>
<th>Course type</th>
<th>Comment</th>
<th>SWS</th>
<th>Frequency</th>
<th>Workload attendance</th>
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</thead>
<tbody>
<tr>
<td>Lecture</td>
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<td>4.00</td>
<td>WiSe</td>
<td>56 h</td>
</tr>
<tr>
<td>Exercises</td>
<td></td>
<td>2.00</td>
<td>WiSe</td>
<td>28 h</td>
</tr>
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</table>

**Total time of attendance for the module**  
84 h
bio285 - Plant Physiology, Molecular Biology and Biotechnology

Module label: Plant Physiology, Molecular Biology and Biotechnology
Module code: bio285
Credit points: 9.0 KP
Workload: 270 h

Used in course of study:
- Fach-Bachelor Biologie > Aufbaumodule
- Zwei-Fächer-Bachelor Biologie > Aufbaumodule

Contact person:
- Module responsibility: Sascha Laubinger
- Authorized examiners: Sascha Laubinger

Entry requirements:
- ++ biological knowledge
- ++ knowledge of biological working methods
- + biologically relevant knowledge in the natural sciences and mathematics
- + statistics & scientific programming
- + abstract, logical, analytical thinking
- + independent learning and (research-based) working
- + teamwork
- + (scientific) communication skills

Skills to be acquired in this module:

Module contents:

Reader's advisory:

Links:
- Language of instruction: German
- Duration (semesters): 1 Semester
- Module frequency: jährlich
- Module capacity: 32
- Modullevel: AC (Aufbaucurriculum / Composition)
- Modulart: Wahlpflicht / Elective
- Lern-/Lehrform / Type of program: lecture, seminar, exercise

Vorkenntnisse / Previous knowledge:

Examination:

<table>
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<th>Type of examination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course type</td>
<td>Comment</td>
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<tr>
<td>Lecture</td>
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</tr>
<tr>
<td>Seminar</td>
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<tr>
<td>Practical</td>
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</tbody>
</table>

Total time of attendance for the module: 98 h
bio295 - Genetics

Module label: Genetics
Module code: bio295
Credit points: 9.0 KP
Workload: 270 h

Used in course of study:
- Fach-Bachelor Biologie > Aufbaumodule
- Master of Education (Sonderpädagogik) Biologie > Frühere Module
- Zwei-Fächer-Bachelor Biologie > Aufbaumodule

Contact person:
- Module responsibility: Maike Claußen
- Authorized examiners:
  - Maike Claußen
  - Hans Gerd Nothwang
  - Anna-Maria Hartmann
  - Lena Ebbers
- Module counseling:
  - Anna-Maria Hartmann
  - Hans Gerd Nothwang
  - Lena Ebbers

Entry requirements:
- Skills to be acquired in this module:
  - ++ biological knowledge
  - ++ knowledge of biological working methods
  - + biologically relevant knowledge in the natural sciences and mathematics
  - + abstract, logical, analytical thinking
  - ++ deepened expertise in biological specialist field
  - ++ independent learning and (research-based) working
  - ++ data presentation and evidence-based discussion (written and spoken)
  - + teamwork
  - ++ (scientific) communication skills
  - + project and time management
  - + knowledge of safety and environmental issues

Module contents:
- Fundamentals of genetics, performing experiments, quantitative analyses.
- General and molecular genetics; mechanisms of mutation, recombination, DNA repair, regulation of transcription; quantitative experiments, prokaryotes and eukaryotes, human genome project, personalized medicine, genetic engineering, safety regulations, sterile working

Reader's advisory:

Links:
- Language of instruction: German
- Duration (semesters): 1 Semester
- Module frequency: jährlich
- Module capacity: 72
- Module level: AC (Aufbaucurriculum / Composition)
- Modulart: Wahlpflicht / Elective
- Lern-/Lehrform / Type of program: lecture, seminar, exercise

Vorkenntnisse / Previous knowledge:

<table>
<thead>
<tr>
<th>Examination</th>
<th>Time of examination</th>
<th>Type of examination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Final exam of module</td>
<td>Written examination (100%), ungraded presentation, protocol</td>
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</table>

<table>
<thead>
<tr>
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<th>Comment</th>
<th>SWS</th>
<th>Frequency</th>
<th>Workload attendance</th>
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<tbody>
<tr>
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<td>WiSe</td>
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<tr>
<td>Exercises</td>
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<td>3.00</td>
<td>WiSe</td>
<td>42 h</td>
</tr>
<tr>
<td>Seminar</td>
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<td>1.50</td>
<td>WiSe</td>
<td>21 h</td>
</tr>
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</table>

Total time of attendance for the module: 84 h
### bio240 - Flora and Fauna

**Module label**  
Flora and Fauna

**Module code**  
bio240

**Credit points**  
10.0 KP

**Workload**  
300 h

**Used in course of study**  
- Fach-Bachelor Biologie > Aufbaumodule

**Contact person**  
Module responsibility  
- Dirk Carl Albach  
- Thomas Glatzel

Authorized examiners  
- Dirk Carl Albach  
- Thomas Glatzel  
- Klaus Bernhard von Hagen

Module counseling  
- Klaus Bernhard von Hagen

**Entry requirements**

**Skills to be acquired in this module**
- + biological knowledge  
- + knowledge of biological working methods  
- + independent learning and (research-based) working  
- + knowledge of safety and environmental issues

To determine species-rich taxa and to verify the results independently using relevant literature

**Module contents**

L: Introduction to the variety of indigenous flora and fauna, presentation of important plant families and animal groups, studying the characteristics important for determination, introduction to systematics. Moreover, subjects are included that present ecological aspects of the taxa dealt with.  
E: Applying literature to determine animal and plant species and to classify them systematically.  
EX: Excursions to the characteristic North German biotopes. The excursions focus on correct identification and classification of plants and animals according to the properties of the living organism.

**Reader’s advisory**

Botany:  
Rothmaler - Exkursionsflora von Deutschland, Band 2 - Grundband, Spektrum Akademischer Verlag

Zoology:  
M. Schaefer: Brohmer - Fauna von Deutschland, from 20th edition

**Links**

**Language of instruction**  
German

**Duration (semesters)**  
2 Semester

**Module frequency**  
jährlich

**Module capacity**  
unlimited

**Modullevel**  
AC (Aufbaucurriculum / Composition)

**Modulart**  
Pflicht / Mandatory

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

**Vorkenntnisse / Previous knowledge**

**Examination**  
Time of examination  
Type of examination

**Final exam of module**  
Botany: Written examination before the end of the lecture  
Zoology: Written examination before the end of the lecture  
1 written examination (Botany 50 %)  
1 written examination (Zoology 50 %)  
ungraded minutes

PLEASE NOTE:  
Additional conditions regarding attendance and ungraded activities as determined by the persons responsible for the module will apply.

**Course type**  
Comment  
SWS  
Frequency  
Workload attendance

<table>
<thead>
<tr>
<th>Lecture</th>
<th></th>
<th>2.00</th>
<th></th>
<th>28 h</th>
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<tbody>
<tr>
<td>Exercises</td>
<td></td>
<td>4.00</td>
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<td>56 h</td>
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<tr>
<td>Study trip</td>
<td></td>
<td>1.00</td>
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<td>14 h</td>
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**Total time of attendance for the module**  
98 h
bio260 - General Microbiology

Module label: General Microbiology
Module code: bio260
Credit points: 10.0 KP
Workload: 300 h

Used in course of study:
- Fach-Bachelor Biologie > Aufbaumodule

Contact person:
- Module responsibility: Ralf Andreas Rabus
- Authorized examiners:
  - Ralf Andreas Rabus
  - Erhard Rhiel
  - Lars Wöhlbrand
- Module counseling:
  - Erhard Rhiel
  - Lars Wöhlbrand

Entry requirements:
- ++ biological knowledge
- ++ knowledge of biological working methods
- + biologically relevant knowledge in the natural sciences and mathematics
- + interdisciplinary knowledge & thinking
- + abstract, logical, analytical thinking
- ++ deepened expertise in biological specialist field
- + independent learning and (research-based) working
- + data presentation and evidence-based discussion (written and spoken)
- ++ teamwork
- + project and time management
- + knowledge of safety and environmental issues

Basic knowledge of microbiology; ability to assess and apply fundamental microbiological techniques.

Module contents:
Imparting basic microbiological skills and working methods: Chemistry and structure of the cell, fundamentals of metabolism, taxonomy and phylogeny of microorganisms, diversity of microorganisms, insight into Applied Microbiology, propagation of microorganisms.

Reader's advisory:
Allgemeine Mikrobiologie, Schlegel 1992; Brock-Biology of Microorganisms, eds.: Madigan et al., 2003; Grundlagen der Mikrobiologie, Cypionka, 2003

Links:
http://www-icbm.de/~gmb/11429.html

Language of instruction:
German

Duration (semesters):
1 Semester

Module frequency:
jährlich

Module capacity:
unlimited

Modullevel:
AC (Aufbaucurriculum / Composition)

Modulart:
Wahlpflicht / Elective

Vorkenntnisse / Previous knowledge:

Examination:

Time of examination:

Type of examination:
1 written examination

Protocols:

PLEASE NOTE:
Additional conditions regarding attendance and ungraded activities as determined by the persons responsible for the module will apply.

Course type:

<table>
<thead>
<tr>
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<th>Comment</th>
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<th>Frequency</th>
<th>Workload attendance</th>
</tr>
</thead>
<tbody>
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<td></td>
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<td></td>
<td>28 h</td>
</tr>
<tr>
<td>Seminar</td>
<td></td>
<td>1.00</td>
<td></td>
<td>14 h</td>
</tr>
<tr>
<td>Practical</td>
<td></td>
<td>4.00</td>
<td></td>
<td>56 h</td>
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<tr>
<td>Total time of attendance for the module</td>
<td></td>
<td></td>
<td></td>
<td>98 h</td>
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</tbody>
</table>
bio270 - Basic Concepts in Animal Physiology

Module label
Basic Concepts in Animal Physiology

Module code
bio270

Credit points
10.0 KP

Workload
300 h

Used in course of study
- Fach-Bachelor Biologie > Aufbaumodule

Contact person
Module responsibility
- Dominik Heyers

Authorized examiners
- Dominik Heyers
- Christine Kölpl
- Karin Dedek

Module counseling
- Christine Kölpl
- Karin Dedek

Entry requirements

Skills to be acquired in this module
++ biological knowledge
++ knowledge of biological working methods
+ biologically relevant knowledge in the natural sciences and mathematics
+ statistics & scientific programming
++ abstract, logical, analytical thinking
+ deepened expertise in biological specialist field
++ independent learning and (research-based) working
+ teamwork

Basic knowledge on physiological processes and their underlying mechanisms with a focus on human physiology. Performing, analysing and documenting physiological experiments.

Module contents
The lecture (Vorlesung: 5.02.271 - Physiologie der Tiere und des Menschen) covers topics such as cell physiology, sensory physiology, neurophysiology, functions of the vegetative system, blood physiology/immune response, blood cycle, respiration and digestion. Emphasis will be on human physiology. In the following lab exercises, students get the opportunity to perform physiological experiments linking to topics from the lecture. By performing experiments on themselves and computer simulations students will gain insight into the underlying physiological principles.

Reader's advisory
Klinke, Pape, Kurtz, Silbernagl: Physiologie, Aufl. 6, 2010
Schmidt, Lang, Heckmann: Physiologie des Menschen mit Pathophysiologie, Aufl. 31, 2011
(if available: Wehner, Gehring: Zoologie)

Links
Language of instruction
German

Duration (semesters)
1 Semester

Module frequency
jährlich

Module capacity
unlimited

Modullevel
AC (Aufbaucurriculum / Composition)

Modulart
Wahlpflicht / Elective

Lern-/Lehrform / Type of program

Vorkenntnisse / Previous knowledge

Examination
Time of examination
Type of examination
Final exam of module
within a few weeks after the winter term lecture period
written exam (100%)

To qualify for the exam, the following additional requirements need to be met:

- regular participation in the laboratory experiments (no more than 1 day of absence)
- lab protocols for each experiment which have been accepted by the respective supervisors

A cumulative bonus can be obtained with good lab work
protocols. The decision whether a given protocol deserves the bonus lies with the respective supervisor of each experiment. The bonus improves the exam mark by maximally two steps (0.7). 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.

PLEASE NOTE:
Additional conditions regarding attendance and ungraded activities as determined by the persons responsible for the module will apply.

<table>
<thead>
<tr>
<th>Course type</th>
<th>Comment</th>
<th>SWS</th>
<th>Frequency</th>
<th>Workload attendance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecture</td>
<td></td>
<td>4.00</td>
<td></td>
<td>56 h</td>
</tr>
<tr>
<td>Exercises</td>
<td></td>
<td>3.00</td>
<td></td>
<td>42 h</td>
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**Total time of attendance for the module**

98 h
### bio280 - Plant Physiology

<table>
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<tr>
<th>Module label</th>
<th>Plant Physiology</th>
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<tbody>
<tr>
<td>Module code</td>
<td>bio280</td>
</tr>
<tr>
<td>Credit points</td>
<td>10.0 KP</td>
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<tr>
<td>Workload</td>
<td>300 h</td>
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#### Used in course of study
- Fach-Bachelor Biologie > Aufbaumodule

#### Contact person
- Module responsibility
  - Sascha Laubinger
- Authorized examiners
  - Sascha Laubinger
  - Gerhard Wolfgang Zotz
- Module counseling
  - Gerhard Wolfgang Zotz

#### Entry requirements

#### Skills to be acquired in this module
- **++** biological knowledge
- **++** knowledge of biological working methods
- **+** biologically relevant knowledge in the natural sciences and mathematics
- **+** statistics & scientific programming
- **+** abstract, logical, analytical thinking
- **+** independent learning and (research-based) working
- **+** teamwork
- **+** (scientific) communication skills

Fundamentals of metabolism and developmental physiology of plants. Theoretical knowledge acquired from lectures and textbooks is improved by experiments, the instructions for experiments are applied independently, laboratory device is handled independently, measured values are calculated independently, the correctness of experimental results is assessed, the results obtained are interpreted and compared to theoretical expectations.

#### Module contents
- **L:** Theoretical knowledge of metabolism and of the control of development in plant organisms, introduction to genetic engineering.
- **S:** Presentation of experiments, presentation of theoretical fundamentals of experiments.
- **L:** Photosynthesis: Physiology of light and dark reactions, photosynthetic ability and environmental factors.
- **Ecophysiology:** Influence of mineral substances on plant growth, function of light as developmental factor, function of plant hormones as developmental factors.

#### Reader's advisory
- Campbell: Biologie; Taiz/Zeiger: Physiologie der Pflanzen (Verlag Spektrum); Buchanan/Gruissem/Jones: Biochemistry and molecular biology of plants (American Society of Plant Physiologists); Kutschera: Prinzipien der Pflanzenphysiologie (Spektrum Akademischer Verlag).

#### Links
- Language of instruction: German
- Duration (semesters): 1 Semester
- Module frequency: jährlich
- Module capacity: unlimited
- Modullevel: AC (Aufbaucurriculum / Composition)
- Modulart: Wahlpflicht / Elective

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

#### Vorkenntnisse / Previous knowledge

#### Examination

<table>
<thead>
<tr>
<th>Final exam of module</th>
<th>in the final week of the semester at the latest</th>
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**PLEASE NOTE:** Additional conditions regarding attendance and ungraded activities as determined by the persons responsible for the module will apply.

<table>
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<th>Course type</th>
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<th>SWS</th>
<th>Frequency</th>
<th>Workload attendance</th>
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</thead>
<tbody>
<tr>
<td>Lecture</td>
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<td>2.00</td>
<td></td>
<td>28 h</td>
</tr>
<tr>
<td>Seminar</td>
<td></td>
<td>1.00</td>
<td></td>
<td>14 h</td>
</tr>
<tr>
<td>Practical</td>
<td></td>
<td>4.00</td>
<td></td>
<td>56 h</td>
</tr>
<tr>
<td>Course type</td>
<td>Comment</td>
<td>SWS</td>
<td>Frequency</td>
<td>Workload attendance</td>
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</tr>
<tr>
<td>Total time of attendance for the module</td>
<td></td>
<td></td>
<td></td>
<td>98 h</td>
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</table>
bio290 - Genetics

Module label: Genetics
Module code: bio290
Credit points: 10.0 KP
Workload: 300 h
Used in course of study: Fach-Bachelor Biologie > Aufbaumodule

Contact person
- Module responsibility: Maike Claußen
- Authorized examiners:
  - Maike Claußen
  - Hans Gerd Nothwang
  - Anna-Maria Hartmann
- Module counseling:
  - Hans Gerd Nothwang
  - Anna-Maria Hartmann

Entry requirements
Skills to be acquired in this module:
++ biological knowledge
++ knowledge of biological working methods
+ biologically relevant knowledge in the natural sciences and mathematics
+ abstract, logical, analytical thinking
++ deepened expertise in biological specialist field
++ independent learning and (research-based) working
++ data presentation and evidence-based discussion (written and spoken)
+ teamwork
++ (scientific) communication skills
+ project and time management
+ knowledge of safety and environmental issues

Fundamentals of genetics, performing experiments, quantitative analyses.

Module contents
- general and molecular genetics; mechanisms of mutation, recombination, DNA repair, regulation of transcription; quantitative experiments, prokaryotes and eukaryotes, human genome project, personalized medicine, genetic engineering, safety regulations, sterile working

Reader's advisory

Links
- Language of instruction: German
- Duration (semesters): 1 Semester
- Module frequency: jährlich
- Module capacity: unlimited
- Modullevel: AC (Aufbaumuccurriculum / Composition)
- Modulart: Wahlpflicht / Elective

Lern-/Lehrform / Type of program

Vorkenntnisse / Previous knowledge

Examination Time of examination Type of examination
Final exam of module

Written examination (100%)
ungraded presentation
ungraded protocol

PLEASE NOTE:
Additional conditions regarding attendance and ungraded activities as determined by the persons responsible for the module will apply.

Course type Comment SWS Frequency Workload attendance
Lecture 1.00
Exercises 0.00 WiSe
Seminar 1.00
<table>
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<th>Comment</th>
<th>SWS</th>
<th>Frequency</th>
<th>Workload attendance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Practical</td>
<td></td>
<td>4.00</td>
<td>WiSe</td>
<td>56 h</td>
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**Total time of attendance for the module** 84 h
### Akzentrumsmoduls

**bio300 - Evolutionary Biology**

<table>
<thead>
<tr>
<th>Module label</th>
<th>Evolutionary Biology</th>
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<tbody>
<tr>
<td>Module code</td>
<td>bio300</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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**Used in course of study**

- Fach-Bachelor Biologie > Akzentsetzungsmodulle
- Master of Education (Gymnasium) Biologie > Mastermodule
- Zwei-Fächer-Bachelor Biologie > Akzentsetzungsmodulle

**Contact person**

- Module responsibility
  - Olaf Bininda-Emonds
  - Wilko Ahlrichs
  - Dirk Carl Albach
  - Gabriele Gerlach
  - Arne Nolte

**Authorized examiners**

- Olaf Bininda-Emonds
- Wilko Ahlrichs
- Dirk Carl Albach
- Gabriele Gerlach
- Arne Nolte

**Entry requirements**

- Skills to be acquired in this module
  - ++ biological knowledge
  - + knowledge of biological working methods
  - ++ biologically relevant knowledge in the natural sciences and mathematics
  - + statistics & scientific programming
  - + interdisciplinary knowledge & thinking
  - + abstract, logical, analytical thinking
  - ++ deepened expertise in biological specialist field
  - + independent learning and research-based working
  - ++ data presentation and evidence-based discussion (written and spoken)
  - ++ teamwork
  - ++ (scientific) communication skills
  - + project and time management

**Module contents**

- Introduction to both microevolution (speciation and species concepts, adaptation and selection, behavioural ecology, reproduction systems) and macroevolution.
- Introduction to phylogenetics (phyloinformatics, molecular systematics, phylogeography).

**Reader’s advisory**


**Links**

- Language of instruction: German
- Duration (semesters): 1 Semester
- Module frequency: jährlich
- Module capacity: unlimited
- Module level: AS (Akzentsetzung / Accentuation)
- Moduleart: Wahlpflicht / Elective

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

**Vorkenntnisse / Previous knowledge**

**Examination**

<table>
<thead>
<tr>
<th>Time of examination</th>
<th>Type of examination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Written examination in the final week of the semester or in the first week following the lecture</td>
<td>Written examination (60%) Portfolio (40%)</td>
</tr>
<tr>
<td>Examination</td>
<td>Time of examination</td>
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PLEASE NOTE: Additional conditions regarding attendance and ungraded activities as determined by the persons responsible for the module will apply.

<table>
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<th>SWS</th>
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<tbody>
<tr>
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<td></td>
<td>28 h</td>
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<td>Exercises</td>
<td></td>
<td>6.00</td>
<td></td>
<td>84 h</td>
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<tr>
<td>Seminar</td>
<td></td>
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<td>28 h</td>
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**Total time of attendance for the module** 140 h
bio310 - General Ecology

Module code: bio310
Credit points: 15.0 KP
Workload: 450 h

Used in course of study:
- Fach-Bachelor Biologie > Akzentsetzungsmodul
- Master of Education (Gymnasium) Biologie > Mastermodule
- Zwei-Fächer-Bachelor Biologie > Akzentsetzungsmodul

Contact person:
- Module responsibility: Helmut Hillebrand
- Authorized examiners:
  - Helmut Hillebrand
  - Rolf Niedringhaus
  - Rainer Buchwald
  - Gerhard Wolfgang Zotz
  - Peter Schupp
  - Sven Rohde
  - Maren Striebel
- Module counseling:
  - Rolf Niedringhaus
  - Rainer Buchwald
  - Gerhard Wolfgang Zotz
  - Peter Schupp
  - Sven Rohde
  - Maren Striebel

Entry requirements:
-++ biological knowledge
-++ knowledge of biological working methods
-++ biologically relevant knowledge in the natural sciences and mathematics
-+ statistics & scientific programming
-+ interdisciplinary knowledge & thinking
-++ abstract, logical, analytical thinking
-+ deepened expertise in biological specialist field
-+ independent learning and (research-based) working
-+ data presentation and evidence-based discussion (written and spoken)
-+ (scientific) communication skills

Module contents:

Reader's advisory:

Links:

Language of instruction: German
Duration (semesters): 2 Semester
Module frequency: jährlich
Module capacity: unlimited
Modullevel: AS (Akzentsetzung / Accentuation)
Modulart: Wahlpflicht / Elective

Lern-/Lehrform / Type of program:

Vorkenntnisse / Previous knowledge:

<table>
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<th>Examination</th>
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Final exam of module:

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Total time of attendance for the module: 84 h
### bio325 - Pollination and Dispersal - Concepts

<table>
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<tbody>
<tr>
<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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</table>
| **Used in course of study** | - Fach-Bachelor Biologie > Akzentsetzungsmodule  
- Fach-Bachelor Mathematik > Nebenfachmodule  
- Master of Education (Gymnasium) Biologie > Mastermodule  
- Zwei-Fächer-Bachelor Biologie > Akzentsetzungsmodule |
| **Contact person**      | Module responsibility  
- Dirk Carl Albach  
Authorized examiners  
- Dirk Carl Albach  
- Klaus Bernhard von Hagen  
- Maria Will  
Module counseling  
- Klaus Bernhard von Hagen  
- Maria Will |
| **Entry requirements**  | bio256 Flora and Fauna                                                    |
| **Skills to be acquired in this module** | + biological knowledge  
+ knowledge of biological working methods  
+ abstract, logical, analytical thinking  
+ deepened expertise in biological specialist field  
+ independent learning and (research-based) working  
+ data presentation and evidence-based discussion (written and spoken)  
+ teamwork  
+ (scientific) communication skills  
+ project and time management  
+ knowledge of safety and environmental issues  
Extended knowledge of biodiversity and evolution of plants focusing on reproduction, dispersal, germination and establishment of plants |
| **Module contents**     | L: Pollination, dispersal, germination of plants, plant breeding  
S: Pollination and dispersal biology of plants in a systematic context |
| **Reader's advisory**   | The course does not follow a special textbook. The following German literature is recommended to students interested in the course: Dieter Heß – Die Blüte, Eugen Ulmer Verlag as well as Leins & Erbar -Blüte und Frucht, Schweizerbart'sche Verlagsbuchhandlung. |
| **Links**               |                                                                             |
| **Language of instruction** | German                                                                     |
| **Duration (semesters)** | 1 Semester                                                                 |
| **Module frequency**    | The module will be offered every other year                                 |
| **Module capacity**     | 12                                                                          |
| **Modullevel**          | AS (Akzentsetzung / Accentuation)                                          |
| **Modulart**            | Wahlpflicht / Elective                                                      |
| **Lern-Lehrform / Type of program** | lecture, seminar                                                           |

#### Examination

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<th>Type of examination</th>
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<tr>
<td>Lecture</td>
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</tr>
<tr>
<td>Seminar</td>
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**Total time of attendance for the module**: 56 h
### bio326 - Pollination and Dispersal - Methods

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</thead>
<tbody>
<tr>
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<td>Workload</td>
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<tr>
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<tr>
<td></td>
<td>Fach-Bachelor Biologie &gt; Akzentsetzungsmodule</td>
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<td></td>
<td>Fach-Bachelor Mathematik &gt; Nebenfachmodule</td>
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<td></td>
<td>Zwei-Fächer-Bachelor Biologie &gt; Akzentsetzungsmodule</td>
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<tr>
<td>Contact person</td>
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<td>Module responsibility</td>
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<tr>
<td></td>
<td>Dirk Carl Albach</td>
</tr>
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<td></td>
<td>Klaus Bernhard von Hagen</td>
</tr>
<tr>
<td>Authorized examiners</td>
<td>Maria Will</td>
</tr>
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<tr>
<td>Module counseling</td>
<td></td>
</tr>
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<td></td>
<td>Klaus Bernhard von Hagen</td>
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<tr>
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<td>Maria Will</td>
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<td>Entry requirements</td>
<td>bio325 Pollination and dispersal concepts</td>
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<tr>
<td></td>
<td>bio256 Flora/Fauna</td>
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<tr>
<td>Skills to be acquired in this module</td>
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<tr>
<td></td>
<td>biological knowledge</td>
</tr>
<tr>
<td></td>
<td>knowledge of biological working methods</td>
</tr>
<tr>
<td></td>
<td>abstract, logical, analytical thinking</td>
</tr>
<tr>
<td></td>
<td>deepened expertise in biological specialist field</td>
</tr>
<tr>
<td></td>
<td>independent learning and (research-based) working</td>
</tr>
<tr>
<td></td>
<td>data presentation and evidence-based discussion (written and spoken)</td>
</tr>
<tr>
<td></td>
<td>teamwork</td>
</tr>
<tr>
<td></td>
<td>(scientific) communication skills</td>
</tr>
<tr>
<td></td>
<td>project and time management</td>
</tr>
<tr>
<td></td>
<td>knowledge of safety and environmental issues</td>
</tr>
<tr>
<td></td>
<td>Extended knowledge of biodiversity and evolution of plants focusing on reproduction, dispersal, germination and establishment of plants</td>
</tr>
<tr>
<td>Module contents</td>
<td>Pollination, fertilisation, dispersal and germination biological experiments in regard of adaptation to environmental factors</td>
</tr>
<tr>
<td>Reader's advisory</td>
<td>The course does not follow a special textbook. The following German literature is recommended to students interested in the course: Dieter Heß – Die Blüte, Eugen Ulmer Verlag as well as Leins &amp; Erbar -Blüte und Frucht, Schweizerbart'sche Verlagsbuchhandlung.</td>
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<td>Language of instruction</td>
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<td>Duration (semesters)</td>
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<td>Module frequency</td>
<td>The module will be offered every other year</td>
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<td>Modullevel</td>
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<tr>
<td>Modulart</td>
<td>Wahlpflicht / Elective</td>
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<tr>
<td>Lern-/Lehrform / Type of program</td>
<td>exercise</td>
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<tr>
<td>Vorkenntnisse / Previous knowledge</td>
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<td>Examination</td>
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<td>Time of examination</td>
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<td>Type of examination</td>
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<td>Final exam of module</td>
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<tr>
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<tr>
<td>Frequency</td>
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<tr>
<td>Workload attendance</td>
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# bio327 - Pollination and Dispersal - Methods not just for Schools

<table>
<thead>
<tr>
<th>Module label</th>
<th>Pollination and Dispersal - Methods not just for Schools</th>
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<tbody>
<tr>
<td>Module code</td>
<td>bio327</td>
</tr>
<tr>
<td>Credit points</td>
<td>9.0 KP</td>
</tr>
<tr>
<td>Workload</td>
<td>270 h</td>
</tr>
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</table>

**Used in course of study**
- Fach-Bachelor Biologie > Akzentsetzungsmodul
- Fach-Bachelor Mathematik > Nebenfachmodule
- Master of Education (Gymnasium) Biologie > Mastermodule
- Zwei-Fächer-Bachelor Biologie > Akzentsetzungsmodul

**Contact person**
- Module responsibility
  - Dirk Carl Albach
- Authorized examiners
  - Dirk Carl Albach
  - Klaus Bernhard von Hagen
  - Maria Will
- Module counseling
  - Klaus Bernhard von Hagen
  - Maria Will

**Entry requirements**
- bio325 Pollination and dispersal concepts
- bio256 Flora/fauna

**Skills to be acquired in this module**
- Biological knowledge
- Knowledge of biological working methods
- Abstract, logical, analytical thinking
- Deepened expertise in biological specialist field
- Independent learning and (research-based) working
- Data presentation and evidence-based discussion (written and spoken)
- Teamwork
- Scientific communication skills
- Project and time management
- Knowledge of safety and environmental issues

Extended knowledge of biodiversity and evolution of plants focusing on reproduction, dispersal, germination and establishment of plants

**Module contents**
The module introduces methods to study pollination, fertilisation, dispersal and germination in regard of adaptation to environmental factors. Experiments applicable to school lessons will be presented and especially thoroughly discussed.

**Reader's advisory**
The course does not follow a special textbook. The following German literature is recommended to students interested in the course: Dieter Heß – Die Blüte, Eugen Ulmer Verlag as well as Leins & Erbar -Blüte und Frucht, Schweizerbart'sche Verlagbuchhandlung.

**Links**

**Language of instruction**
- German

**Duration (semesters)**
- 1 Semester

**Module frequency**

**Module capacity**
- 12

**Module level**
- AS (Akzentsetzung / Accentuation)

**Modulart**
- Wahlpflicht / Elective

**Vorkenntnisse / Previous knowledge**

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

**Final exam of module**
- portfolio

**Course type**
- Exercises

**SWS**
- 6.00

**Frequency**
- SuSe

**Workload attendance**
- 84 h
bio330 - Marine Ecology

Module label: Marine Ecology
Module code: bio330
Credit points: 15.0 KP
Workload: 450 h

Used in course of study:
- Fach-Bachelor Biologie > Akzentsetzungsmodul
- Master of Education (Gymnasium) Biologie > Mastermodule
- Zwei-Fächer-Bachelor Biologie > Akzentsetzungsmodul

Contact person:
- Module responsibility: Helmut Hillebrand
- Authorized examiners: Helmut Hillebrand, Stefanie Moorthi
- Module counseling: Stefanie Moorthi

Entry requirements:
Skills to be acquired in this module:
++ biological knowledge
++ knowledge of biological working methods
++ biologically relevant knowledge in the natural sciences and mathematics
+ statistics & scientific programming
+ interdisciplinary knowledge & thinking
++ abstract, logical, analytical thinking
++ deepened expertise in biological specialist field
++ independent learning and (research-based) working
++ data presentation and evidence-based discussion (written and spoken)
+ teamwork
++ (scientific) communication skills
+ project and time management

Basic knowledge and practical experience in biological oceanography
Apply theoretical concepts from different fields in marine ecology
Analyse, present, and interpret results from the marine ecological literature and own investigations
Acknowledge the importance of general ecological concepts for ecosystem management
Gain experience in the application of field and lab methods in ecology

Module contents:
Lecture Biological Oceanography
2 SWS = 3 CP. Presence time 24 h, additional study time 66h, winter-term
Abiotic environmental conditions in marine systems (light, temperature, chemical and physical properties of the water, waves, tides, global distribution of water masses and currents. Pelagic communities, plankton (phyto-, zoo-, bacterio-, viroplankton), microbial loop, sedimentation, C-and N cycling, Nekton, Fisheries, El Nino, Benthic communities, estuaries.

Exercise Concepts in marine ecology
6 SWS = 9 CP. Presence time 70 h, additional study time 200h, winter-term
Practical and theoretical exercises on marine ecology, including field studies, experiments and working with case studies from the literature. The focus is on concepts here, pinpointing at general ecological frameworks.

Lecture Marine Ecology
2 SWS = 3 CP. Presence time 24 h, additional study time 66h, winter-term
Ecology of marine systems: estuaries, rocky and sediment coasts, pelagial, shelves, mangroves, seagrass meadows, coral reefs, deep sea, polar regions. The focus is on ecological specifics and interactions in the biotic communities of these systems. The second half of the lecture will focus on importance and consequences of overfishing, habitat destruction, pollution, climate change and bioinvasion on marine systems.

Reader's advisory:
U. Sommer, Biologische Meereskunde, Springer Verlag, Heidelberg.

Links:

Language of instruction: German
Duration (semesters): 2 Semester
Module frequency: jährlich
Module capacity: unlimited
Modullevel: AS (Akzentsetzung / Accentuation)
Modulart: Wahlpflicht / Elective
## Lern-/Lehrform / Type of program

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<th>Time of examination</th>
<th>Type of examination</th>
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<td>Written exam at the end of the Lecture Marine Ecology</td>
<td>1 written exam (Lecture) (50%), 1 oral presentation (Exercise) (50%)</td>
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**PLEASE NOTE:** Additional conditions regarding attendance and ungraded activities as determined by the persons responsible for the module will apply.

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<th>SWS</th>
<th>Frequency</th>
<th>Workload attendance</th>
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<tr>
<td>Exercises</td>
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<td>6.00</td>
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<td>84 h</td>
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</table>

**Total time of attendance for the module**

140 h
bio340 - Morphology, Phylogeny, and Evolution of Metazoa

Module label: Morphology, Phylogeny, and Evolution of Metazoa

Module code: bio340

Credit points: 15.0 KP

Workload: 450 h

Used in course of study:
- Fach-Bachelor Biologie > Akzentsetzungsmodule
- Master of Education (Gymnasium) Biologie > Mastermodule
- Zwei-Fächer-Bachelor Biologie > Akzentsetzungsmodule

Contact person:
- Module responsibility: Olaf Bininda-Emonds
- Authorized examiners:
  - Olaf Bininda-Emonds
  - Wilko Ahlrichs
- Module counseling:
  - Wilko Ahlrichs

Entry requirements:

Skills to be acquired in this module:

++ biological knowledge
+ knowledge of biological working methods
++ biologically relevant knowledge in the natural sciences and mathematics
+ statistics & scientific programming
+ interdisciplinary knowledge & thinking
+ abstract, logical, analytical thinking
++ deepened expertise in biological specialist field
+ independent learning and (research-based) working
++ data presentation and evidence-based discussion (written and spoken)
+ teamwork
++ (scientific) communication skills
+ project and time management

Upon successful completion of the module the students will gain:
1. a survey of topical subjects relating to the morphology and phylogeny of animals,
2. a thorough knowledge of the development of morphological characteristics,
3. technical skills in studying morphological structures, and
4. knowledge into recent hypotheses on the phylogeny of animals.

Module contents:

Lecture: Details regarding the morphology and evolution of Metazoa from an explicit phylogenetic framework
Seminar: Presentation and discussion of recent subjects and issues relating to the evolution of Metazoa; presentation of individual metazoan taxa
Exercise: Preparation and documentation of exemplary species of Metazoa; various field studies (e.g. visit to the Dierenpark Emmen or to the Zoo am Meer (Bremerhaven), sampling aquatic micrometazoans, observing birds)

Reader's advisory:
Relevant literature will be announced during the first seminar and is contingent on the latest developments in the research field.

Links:
- Language of instruction: German
- Duration (semesters): 1 Semester
- Module frequency: jährlich
- Module capacity: unlimited
- Module level: AS (Akzentsetzung / Accentuation)
- Modulart: Wahlpflicht / Elective

Vorkenntnisse / Previous knowledge:

Examination: Portfolio during the course of the seminar; written examination in the final week of the course or in the first week following the lecture period.

Type of examination:
1 Written examination (50%),
1 Portfolio (50%),

PLEASE NOTE:
Additional conditions regarding attendance and ungraded activities as determined by the persons responsible for the module will apply.
<table>
<thead>
<tr>
<th>Course type</th>
<th>Comment</th>
<th>SWS</th>
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Total time of attendance for the module 126 h
bio355 - Microscopical Anatomy

Module label  Microscopical Anatomy
Module code  bio355
Credit points  9.0 KP
Workload  270 h

Used in course of study
- Fach-Bachelor Biologie > Akzentsetzungsmodul
- Fach-Bachelor Mathematik > Nebenfachmodule
- Master of Education (Gymnasium) Biologie > Mastermodule
- Zwei-Fächer-Bachelor Biologie > Akzentsetzungsmodul

Contact person

Module responsibility
- Wilko Ahlrichs

Authorized examiners
- Wilko Ahlrichs
- Alexander Kieneke
- Mona Hoppenrath

Module counseling
- Alexander Kieneke
- Mona Hoppenrath

Entry requirements

Skills to be acquired in this module
- ++ biological knowledge
- ++ knowledge of biological working methods
- ++ biologically relevant knowledge in the natural sciences and mathematics
- * interdisciplinary knowledge & thinking
- ++ abstract, logical, analytical thinking
- ++ deepened expertise in biological specialist field
- ++ independent learning and (research-based) working
- ++ data presentation and evidence-based discussion (written and spoken)
- + teamwork
- ++ (scientific) communication skills
- + project and time management
- + knowledge of safety and environmental issues

This course is designed for students to learn about the basic light and electron optical methods. Students will be able to work with preparative techniques for scanning electron microscopy, transmission electron microscopy, and light microscopy, and confocal scanning laser microscopy. Students completing this course will have learned basic principles for fixing and embedding biological materials for electron microscopy. Students will have learned how to operate a transmission electron microscope, a scanning electron microscope, several ultramicrotomes, a vacuum evaporator, a critical point dryer, and a sputter coater. Digital imaging techniques that will be learned will include print making, design and assembly of materials for publication, PowerPoint presentations, and poster design. Students will be introduced to the principles of light microscopy utilizing different optical sys-tems and will have the opportunity to have hands-on experience with a Leica photomicroscope as well as the Leica SP5 confocal laser scanning.

Module contents
Microscopy of protists and micro metazoans. Students are required plan and carry out a research project that exposes them to some of the challenges and problems encountered by microscopical anato-my - and some of the techniques that are used to solve these problems. Students have to present a scientific poster, a short oral presentation and a scientific paper.

Reader's advisory
Will be announced in the course.

Links
Language of instruction  German
Duration (semesters)  1 Semester
Module frequency  annually
Module capacity  8 (For more applicants than places, a motivation letter decides on the admission.)
Modullevel  AS (Akzentsetzung / Accentuation)
Modulart  Wahlpflicht / Elective
Lern-/Lehrform / Type of program  lecture/seminar, exercise
Vorkenntnisse / Previous knowledge
Examination  Time of examination  Type of examination
<table>
<thead>
<tr>
<th>Examination</th>
<th>Time of examination</th>
<th>Type of examination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Final exam of module</td>
<td>end of module</td>
<td>portfolio</td>
</tr>
<tr>
<td>Course type</td>
<td>Comment</td>
<td>SWS</td>
</tr>
<tr>
<td>Vorlesung und Seminar</td>
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<td>WiSe</td>
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<td><strong>Total time of attendance for the module</strong></td>
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bio360 - Marine Biodiversity

Module label: Marine Biodiversity
Module code: bio360
Credit points: 15.0 KP
Workload: 450 h

Used in course of study:
- Fach-Bachelor Biologie > Akzentsetzungsmodul
- Master of Education (Gymnasium) Biologie > Mastermodule
- Zwei-Fächer-Bachelor Biologie > Akzentsetzungsmodul

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

Entry requirements:

Skills to be acquired in this module:
++ biological knowledge
++ knowledge of biological working methods
+ interdisciplinary knowledge & thinking
+ abstract, logical, analytical thinking
++ deepened expertise in biological specialist field
++ independent learning and (research-based) working
++ data presentation and evidence-based discussion (written and spoken)
+ teamwork
+ (scientific) communication skills
+ project and time management

By active participation the students acquire the following knowledge/abilities/qualification:

- Preparation and organization of sampling
- Keeping organisms – field study
- Marine deposits, development of marine sediments and their effects on the fauna
- Methods of meiofauna and macrofauna sampling, also plankton sampling
- Methods of quantitative community analysis
- Diversity comparison of various sites applying statistical methods
- Multivariate statistics for correlation of biocenoses and environmental variables
- Biocenoses of marine habitats
- Biology, morphology, systematics, behaviour and ecology of selected taxa in marine water systems
- Formulation and definition of scientific questions and selection of methods
- Habitat and biocenoses, interstitial, littoral (lotic, lentic), diversity
- Planning behavioural experiments
- Presentation and discussion of scientific results
- Independent scientific work in groups and presentation of results

Module contents:
The module gives an introduction to marine biodiversity research demonstrated by various animal groups from the Wadden Sea and the North Sea including independent sampling on the coast and on the islands. The students will collect the organisms in the field or on board using sampling equipment. In the laboratory course, the biology and morphology as well as the ecology and behaviour of certain species are investigated and documented. The morphology of marine sediments and their development are further aspects of this module.

Reader's advisory:
HIGGINS, R.P. & H., THIEL, 1988: Introduction to the Study of Meiofauna. Smithsonian Institution Press,
The literature listed above is available in the university library. More reading will be recommended in the course of the lecture.

Links
Language of instruction | German
Duration (semesters) | 1 Semester
Module frequency | jährlich
Module capacity | unlimited
Modullevel | AS (Akzentsetzung / Accentuation)
Modulart | Wahlpflicht / Elective

Vorkenntnisse / Previous knowledge

Examination | Time of examination | Type of examination
--- | --- | ---
Final exam of module | During lectures | 1 Portfolio

Please note:
Additional conditions regarding attendance and ungraded activities as determined by the persons responsible for the module will apply.

Course type | Comment | SWS | Frequency | Workload attendance
--- | --- | --- | --- | ---
Lecture | 2.00 | 28 h
Exercises | 9.00 | 126 h
Seminar | 2.00 | 28 h
Total time of attendance for the module | 182 h
bio375 - Flora - Advanced Concepts

Module label: Flora - Advanced Concepts
Module code: bio375
Credit points: 6.0 KP
Workload: 180 h

Used in course of study:
- Fach-Bachelor Biologie > Akzentsetzungsmodule
- Fach-Bachelor Mathematik > Nebenfachmodule
- Master of Education (Gymnasium) Biologie > Mastermodule
- Zwei-Fächer-Bachelor Biologie > Akzentsetzungsmodule

Contact person:
Module responsibility: Dirk Carl Albach
Authorized examiners:
- Dirk Carl Albach
- Klaus Bernhard von Hagen
- Maria Will
Module counseling:
- Klaus Bernhard von Hagen
- Maria Will

Entry requirements:
bio256 Flora and Fauna

Skills to be acquired in this module:
- biological knowledge
- knowledge of biological working methods
- deepened expertise in biological specialist field
- independent learning and (research-based) working
- data presentation and evidence-based discussion (written and spoken)
- (scientific) communication skills
- knowledge of safety and environmental issues

The module is intended to give students in-depth knowledge on plant determination and the diversity of plants. Students shall increase their knowledge on species and learn and improve their abilities in plant determination and plant conservation. Subjects and methods relevant for nature conservation are emphasized. Along with these, students shall improve their systemic thinking with relation to nature in northwestern Germany and its flora. Students learn about plants and how to group them according to their phylogeny and evolutionary adaptations, so they can pass this knowledge on to others. Competence in assessment is conveyed in the areas of diversity and nature conservation to sensibilize students for a respectful treatment of nature and passing on this ability to others. Finally, we will discuss sustainable use of plants and habitats and their restoration.

Module contents:
The module comprises a lecture in the Botanical Garden, where plants will be observed and investigated. This includes algae, bryophytes, ferns, gymnosperms and various families of angiosperms. The seminar is intended to let students study in-depth additional plant families with their typical characters.

Reader’s advisory:
Rothmaler - Exkursionsflora von Deutschland. Gefäßpflanzen: Grundband

Links:
Language of instruction: German
Duration (semesters): 1 Semester
Module frequency: The module will be offered every other year
Module capacity: 12
Modullevel: AS (Akzentsetzung / Accentuation)
Modulart: Wahlpflicht / Elective
Lern-/Lehrform / Type of program: lecture, seminar

Vorkenntnisse / Previous knowledge:

<table>
<thead>
<tr>
<th>Examination</th>
<th>Time of examination</th>
<th>Type of examination</th>
<th>Portfolio</th>
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<tbody>
<tr>
<td>Final exam of module</td>
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<table>
<thead>
<tr>
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<th>Comment</th>
<th>SWS</th>
<th>Frequency</th>
<th>Workload attendance</th>
</tr>
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<tbody>
<tr>
<td>Lecture</td>
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<td>2.00</td>
<td>SuSe</td>
<td>28 h</td>
</tr>
<tr>
<td>Seminar</td>
<td></td>
<td>2.00</td>
<td>SuSe</td>
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Total time of attendance for the module: 56 h
### bio376 - Flora - Advanced Methods

<table>
<thead>
<tr>
<th>Module label</th>
<th>Flora - Advanced Methods</th>
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<tbody>
<tr>
<td>Module code</td>
<td>bio376</td>
</tr>
<tr>
<td>Credit points</td>
<td>6.0 KP</td>
</tr>
<tr>
<td>Workload</td>
<td>180 h</td>
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</table>
| Used in course of study | - Fach-Bachelor Biologie > Akzentsetzungsmodule
|                    | - Fach-Bachelor Mathematik > Nebenfachmodule
|                    | - Zwei-Fächer-Bachelor Biologie > Akzentsetzungsmodule         |
| Contact person     | Module responsibility                                         |
|                    | - Dirk Carl Albach                                             |
| Authorized examiners | - Dirk Carl Albach                                           |
|                    | - Klaus Bernhard von Hagen                                      |
|                    | - Maria Will                                                   |
| Module counseling  | - Klaus Bernhard von Hagen                                      |
|                    | - Maria Will                                                   |
| Entry requirements | bio256 Flora and Fauna                                         |
|                    | bio375 Flora - Advanced concepts                               |
| Skills to be acquired in this module | + biological knowledge                                      |
|                    | + knowledge of biological working methods                     |
|                    | + deepened expertise in biological specialist field            |
|                    | + independent learning and (research-based) working            |
|                    | + data presentation and evidence-based discussion (written and spoken) |
|                    | + (scientific) communication skills                            |
|                    | + knowledge of safety and environmental issues                 |

The module is intended to give students in-depth knowledge on plant determination and the diversity of plants. Students shall increase their knowledge on species and learn and improve their abilities in plant determination and plant conservation. Subjects and methods relevant for nature conservation are emphasized. Along with these, students shall improve their systemic thinking with relation to nature in northwestern Germany and its flora. Students learn about plants and how to group them according to their phylogeny and evolutionary adaptations, so they can pass this knowledge on to others. Competence in assessment is conveyed in the areas of diversity and nature conservation to sensibilize students for a respectful treatment of nature and passing on this ability to others. Finally, we will discuss sustainable use of plants and habitats and their restoration.

<table>
<thead>
<tr>
<th>Module contents</th>
<th>The exercises will be used to apply the abilities to plant species in the vicinity of Oldenburg and to practice methods in mapping and surveying plant species.</th>
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<tbody>
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<td>Reader's advisory</td>
<td>Rothmaler - Exkursionsflora von Deutschland. Gefäßpflanzen: Grundband</td>
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<td>Duration (semesters)</td>
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<td>Module frequency</td>
<td>The module will be offered every other year</td>
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<tr>
<td>Module capacity</td>
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<td>Modulelevel</td>
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<tr>
<td>Modulart</td>
<td>Wahlpflicht / Elective</td>
</tr>
<tr>
<td>Lern-/Lehrform / Type of program</td>
<td>exercise</td>
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<tr>
<td>Vorkenntnisse / Previous knowledge</td>
<td></td>
</tr>
<tr>
<td>Examination</td>
<td>Time of examination</td>
</tr>
<tr>
<td>Final exam of module</td>
<td>portfolio</td>
</tr>
<tr>
<td>Course type</td>
<td>Exercises</td>
</tr>
<tr>
<td>SWS</td>
<td>4.00</td>
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<tr>
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<td>SuSe</td>
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<tr>
<td>Workload attendance</td>
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</table>


bio377 - Flora - Advanced Methods not just for schools

<table>
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<tbody>
<tr>
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<td>• Fach-Bachelor Mathematik &gt; Nebenfachmodule</td>
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<td></td>
<td>• Master of Education (Gymnasium) Biologie &gt; Mastermodule</td>
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<td></td>
<td>• Zwei-Fächer-Bachelor Biologie &gt; Akzentsetzungsmoduule</td>
</tr>
<tr>
<td>Contact person</td>
<td>Module responsibility</td>
</tr>
<tr>
<td></td>
<td>• Dirk Carl Albach</td>
</tr>
<tr>
<td>Authorized examiners</td>
<td>• Dirk Carl Albach</td>
</tr>
<tr>
<td></td>
<td>• Klaus Bernhard von Hagen</td>
</tr>
<tr>
<td></td>
<td>• Maria Will</td>
</tr>
<tr>
<td>Module counseling</td>
<td>• Klaus Bernhard von Hagen</td>
</tr>
<tr>
<td></td>
<td>• Maria Will</td>
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<td>Entry requirements</td>
<td>bio375 Flora - Advanced Concepts</td>
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<td>bio256 Flora and Fauna</td>
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<td>Skills to be acquired in this module</td>
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<tr>
<td></td>
<td>+ knowledge of biological working methods</td>
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<tr>
<td></td>
<td>+ deepened expertise in biological specialist field</td>
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<td></td>
<td>+ independent learning and (research-based) working</td>
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<td></td>
<td>+ data presentation and evidence-based discussion (written and spoken)</td>
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<tr>
<td></td>
<td>+ (scientific) communication skills</td>
</tr>
<tr>
<td></td>
<td>+ knowledge of safety and environmental issues</td>
</tr>
<tr>
<td>Module contents</td>
<td>The module is intended to give students in-depth knowledge on plant determination and the diversity of plants. Students shall increase their knowledge on species and learn and improve their abilities in plant determination and plant conservation. Subjects and methods relevant for nature conservation are emphasized. Along with these, students shall improve their systemic thinking with relation to nature in northwestern Germany and its flora. Students learn about plants and how to group them according to their phylogeny and evolutionary adaptations, so they can pass this knowledge on to others. Competence in assessment is conveyed in the areas of diversity and nature conservation to sensibilize students for a respectful treatment of nature and passing on this ability to others. Finally, we will discuss sustainable use of plants and habitats and their restoration.</td>
</tr>
<tr>
<td>Reader's advisory</td>
<td>Rothmaler - Exkursionsflora von Deutschland, Gefäßpflanzen: Grundband</td>
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<td>Links</td>
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<td>Language of instruction</td>
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</tr>
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<td>Duration (semesters)</td>
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</tr>
<tr>
<td>Module frequency</td>
<td>The module will be offered every other year</td>
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<td>Module capacity</td>
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<td>Modullevel</td>
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<tr>
<td>Modulart</td>
<td>Wahlpflicht / Elective</td>
</tr>
<tr>
<td>Lern-/Lehrform / Type of program</td>
<td>exercise</td>
</tr>
<tr>
<td>Vorkenntnisse / Previous knowledge</td>
<td></td>
</tr>
<tr>
<td>Examination</td>
<td>Time of examination</td>
</tr>
<tr>
<td>Final exam of module</td>
<td>portfolio</td>
</tr>
<tr>
<td>Course type</td>
<td>Exercises</td>
</tr>
<tr>
<td>SWS</td>
<td>6.00</td>
</tr>
<tr>
<td>Frequency</td>
<td>SuSe</td>
</tr>
<tr>
<td>Workload attendance</td>
<td>84 h</td>
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</table>
**bio385 - Specific Microbiology**

<table>
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<tr>
<th>Module label</th>
<th>Specific Microbiology</th>
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<tr>
<td>Module code</td>
<td>bio385</td>
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<tr>
<td>Credit points</td>
<td>12.0 KP</td>
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<tr>
<td>Workload</td>
<td>360 h</td>
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**Used in course of study**
- Fach-Bachelor Biologie > Akzentsetzungsmodule
- Master of Education (Gymnasium) Biologie > Mastermodule
- Zwei-Fächer-Bachelor Biologie > Akzentsetzungsmodule

**Contact person**
- Module responsibility
  - Ralf Andreas Rabus
- Authorized examiners
  - Ralf Andreas Rabus
  - Daniel Wünsch
- Module counseling
  - Daniel Wünsch

**Entry requirements**
- bio233 Basics in microbiology and genetics
- bio265 general microbiology

**Skills to be acquired in this module**

**Module contents**

**Reader's advisory**

**Links**

**Language of instruction**
- German

**Duration (semesters)**
- 1 Semester

**Module frequency**
- 8

**Module level**
- AS (Akzentsetzung / Accentuation)

**Modulart**
- Wahlpflicht / Elective

**Lern-/Lehrform / Type of program**
- lecture, seminar, exercise

**Vorkenntnisse / Previous knowledge**
- chemistry

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

**Final exam of module**

<table>
<thead>
<tr>
<th>Course type</th>
<th>Comment</th>
<th>SWS</th>
<th>Frequency</th>
<th>Workload attendance</th>
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<tbody>
<tr>
<td>Lecture</td>
<td></td>
<td>2.00</td>
<td>WiSe</td>
<td>28 h</td>
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<tr>
<td>Seminar</td>
<td></td>
<td>2.00</td>
<td>WiSe</td>
<td>28 h</td>
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<tr>
<td>Practical</td>
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<td>84 h</td>
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**Total time of attendance for the module**
- 140 h
bio395 - Plant Molecular Biology and Genetics I

<table>
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<th>Module label</th>
<th>Plant Molecular Biology and Genetics I</th>
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<tbody>
<tr>
<td>Module code</td>
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<td>6.0 KP</td>
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<tr>
<td>Workload</td>
<td>180 h</td>
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**Used in course of study**
- Fach-Bachelor Biologie > Akzentsetzungsmodul
- Fach-Bachelor Mathematik > Nebenfachmodule
- Master of Education (Gymnasium) Biologie > Mastermodule
- Zwei-Fächer-Bachelor Biologie > Akzentsetzungsmodule

**Contact person**
- Module responsibility: Sascha Laubinger
- Authorized examiners: Sascha Laubinger, Udo Gowik
- Module counseling: Udo Gowik

**Entry requirements**
**Skills to be acquired in this module**
- ++ biological knowledge
- ++ knowledge of biological working methods
- + biologically relevant knowledge in the natural sciences and mathematics
- + statistics & scientific programming
- ++ interdisciplinary knowledge & thinking
- ++ abstract, logical, analytical thinking
- ++ deepened expertise in biological specialist field
- ++ independent learning and (research-based) working
- ++ data presentation and evidence-based discussion (written and spoken)
- ++ teamwork
- ++ (scientific) communication skills
- ++ project and time management
- + knowledge of safety and environmental issues

The module serves the in-depth study of state-of-the-art techniques and problems in the field of molecular plant biology and plant genetics. Specialist competencies: basic knowledge in plant genetics, plant developmental genetics, plant/environment interactions and molecular basis of gene regulation.

General competencies: Presentation of scientific papers, presentation techniques, teamwork, problem solving competencies

**Module contents**
Part of this module is a lecture that addresses several topics of modern plant molecular biology. The main focus is on plant developmental genetics, plant/environment interactions and the underlying molecular mechanisms of gene regulation in plants. At the beginning of the module, the students will present diverse molecular biology techniques and the latest developments in the field in a "method and techniques" seminar. In a "literature" seminar, the students will present and discuss a recent publication on one of the above-mentioned topics.

**Reader’s advisory**
Literature will be handed out at the beginning of the course.

**Links**
- Languages of instruction: German, English
- Duration (semesters): 1 Semester
- Module frequency: 16
- Reference text: This module is mandatory for "Plant molecular biology and genetics II"
- Modullevel: AS (Akzentsetzung / Accentuation)
- Modulart: Wahlpflicht / Elective
- Lern-/Lehrform / Type of program: lecture, seminar

**Vorkenntnisse / Previous knowledge**

<table>
<thead>
<tr>
<th>Examination</th>
<th>Time of examination</th>
<th>Type of examination</th>
<th>Written examination (good seminar presentations improve the grade)</th>
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</thead>
<tbody>
<tr>
<td>Final exam of module</td>
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<td></td>
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</table>

**Course type**
- Comment: Written examination (good seminar presentations improve the grade)
- SWS: 2.00
- Frequency: WiSe
- Workload attendance: 28 h
<table>
<thead>
<tr>
<th>Course type</th>
<th>Comment</th>
<th>SWS</th>
<th>Frequency</th>
<th>Workload attendance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seminar</td>
<td></td>
<td>2.00</td>
<td>WiSe</td>
<td>28 h</td>
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</table>

**Total time of attendance for the module**

56 h
bio396 - Plant Molecular Biology and Genetics II

Module label
Plant Molecular Biology and Genetics II

Module code
bio396

Credit points
6.0 KP

Workload
180 h

Used in course of study
- Fach-Bachelor Biologie > Akzentsetzungsmodule
- Fach-Bachelor Mathematik > Nebenfachmodule
- Master of Education (Gymnasium) Biologie > Mastermodule
- Zwei-Fächer-Bachelor Biologie > Akzentsetzungsmodule

Contact person
Module responsibility
- Sascha Laubinger

Authorized examiners
- Sascha Laubinger
- Udo Gowik

Module counseling
- Udo Gowik

Entry requirements
bio395 Plant molecular biology and genetics I

Skills to be acquired in this module
++ biological knowledge
++ knowledge of biological working methods
+ biologically relevant knowledge in the natural sciences and mathematics
+ statistics & scientific programming
++ interdisciplinary knowledge & thinking
++ abstract, logical, analytical thinking
++ deepened expertise in biological specialist field
++ independent learning and (research-based) working
++ data presentation and evidence-based discussion (written and spoken)
++ teamwork
++ (scientific) communication skills
++ project and time management
+ knowledge of safety and environmental issues

The module serves the in-depth study of state-of-the-art techniques and problems in the field of molecular plant biology and plant genetics.

Specialist competencies: Acquiring basic skill in plant molecular biology, genetics and plant biochemistry
Methodological competencies: molecular biology techniques, conducted independently
General competencies: Presentation of scientific results, presentation techniques, teamwork, problem solving competencies

Module contents
Part of this module is a lecture that addresses several topics of modern plant molecular biology. The main focus is on plant developmental genetics, plant/environment interactions and the underlying molecular mechanisms of gene regulation in plants. At the beginning of the module, the students will present diverse molecular biology techniques and the latest developments in the field in a "method and techniques" seminar. In a "literature" seminar, the students will present and discuss a recent publication on one of the above-mentioned topics.

Reader's advisory
Literature will be handed out at the beginning of the course.

Links
Languages of instruction
German, English

Duration (semesters)
1 Semester

Module frequency
annually

Module capacity
16

Modullevel
AS (Akzentsetzung / Accentuation)

Modulart
Wahlpflicht / Elective

Lern-/Lehrform / Type of program
exercise

Vorkenntnisse / Previous knowledge

Examination Time of examination Type of examination
Final exam of module
portfolio (presentation, protocols)

Course type
Exercises

SWS
4.00

Frequency
WiSe
| Workload attendance | 56 h |
bio405 - Introduction to Neurobiology I

**Module code**
bio405

**Credit points**
12.0 KP

**Workload**
360 h

**Used in course of study**
- Fach-Bachelor Biologie > Akzentsetzungsmodul
- Fach-Bachelor Mathematik > Nebenfachmodule
- Master of Education (Gymnasium) Biologie > Mastermodule
- Zwei-Fächer-Bachelor Biologie > Akzentsetzungsmodul

**Contact person**
- Module responsibility: Martin Greschner
- Authorized examiners: Martin Greschner, Ulrike Janssen-Bienhold, Georg Martin Klump
- Module counseling: Karl-Wilhelm Koch, Ulrike Janssen-Bienhold, Georg Martin Klump

**Entry requirements**
- **Skills to be acquired in this module**:
  - ++ deepened biological expertise
  - ++ deepened knowledge of biological working methods
  - * scientific/mathematical basic knowledge relevant for biology
  - * critical and analytical thinking
  - ++ data presentation and discussion in German (written and spoken)
  - + teamwork

**Module contents**
The lecture covers the molecular and cellular basis of neurobiology, the electrical properties of nerve cells, the organization and development of the nervous system and the function of the motor system. In the seminar, topics related to the lectures of the week are covered in more depth. In the exercises, the theoretical knowledge from the lectures will be tested in small experiments.

**Reader’s advisory**

**Links**

**Language of instruction**
German

**Duration (semesters)**
1 Semester

**Module frequency**
annually

**Module capacity**
30

**Reference text**
associated with the modules bio415 and bio416 Introduction to Neurobiology II in the winter semester

**Modullevel**
AS (Akzentsetzung / Accentuation)

**Modultyp**
Wahlpflicht / Elective

**Vorkenntnisse / Previous knowledge**
Basics in physiology and cellular biology

**Exam**

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<th>Comment</th>
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<th>Type of examination</th>
<th>Workload attendance</th>
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<tbody>
<tr>
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<td>exam and protocol</td>
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<tr>
<td>Seminar</td>
<td></td>
<td>SWS</td>
<td>Frequency</td>
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<tr>
<td>Exercises</td>
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<tr>
<td>Tutorial</td>
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**Final exam of module**

<table>
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<tr>
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<tr>
<td>Tutorial</td>
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**Total time of attendance for the module**
112 h
## bio415 - Introduction to Neurobiology II

<table>
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<th>Introduction to Neurobiology II</th>
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<tr>
<td>Module code</td>
<td>bio415</td>
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<tr>
<td>Credit points</td>
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<td>Workload</td>
<td>180 h</td>
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<tr>
<td>Used in course of study</td>
<td>Fach-Bachelor Biologie &gt; Akzentsetzungsmodule</td>
</tr>
<tr>
<td></td>
<td>Fach-Bachelor Mathematik &gt; Nebenfachmodule</td>
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<tr>
<td></td>
<td>Master of Education (Gymnasium) Biologie &gt; Mastermodule</td>
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<tr>
<td></td>
<td>Zwei-Fächer-Bachelor Biologie &gt; Akzentsetzungsmodule</td>
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<tr>
<td>Contact person</td>
<td>Module responsibility</td>
</tr>
<tr>
<td></td>
<td>▪ Georg Martin Klump</td>
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<tr>
<td>Authorized examiners</td>
<td>▪ Georg Martin Klump</td>
</tr>
<tr>
<td></td>
<td>▪ Christiane Margarete Thiel</td>
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<tr>
<td></td>
<td>▪ Christine Köppl</td>
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<td>▪ Martin Greschner</td>
</tr>
<tr>
<td></td>
<td>▪ Jannis Hildebrandt</td>
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<tr>
<td>Module counseling</td>
<td>▪ Christiane Margarete Thiel</td>
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<td>▪ Jannis Hildebrandt</td>
</tr>
<tr>
<td>Entry requirements</td>
<td><strong>deepened biological expertise</strong></td>
</tr>
<tr>
<td></td>
<td><strong>deepened knowledge of biological working methods</strong></td>
</tr>
<tr>
<td></td>
<td>+ scientific/mathematical basic knowledge relevant for biology</td>
</tr>
<tr>
<td></td>
<td>+ critical and analytical thinking</td>
</tr>
<tr>
<td>Skills to be acquired in this module</td>
<td>The lecture covers the basics of systemic neuroscience with a focus on processing in sensory systems, the plasticity of the nervous system and the mechanisms underlying cognitive processing. In the seminar, topics related to the lectures of the week are covered in more depth.</td>
</tr>
<tr>
<td>Reader's advisory</td>
<td>Language of instruction</td>
</tr>
<tr>
<td></td>
<td>German</td>
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<td>Duration (semesters)</td>
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<td>Module frequency</td>
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<td>AS (Akzentsetzung / Accentuation)</td>
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<td>Modulart</td>
<td>Wahlpflicht / Elective</td>
</tr>
<tr>
<td>Lern-/Lehrform / Type of program</td>
<td>lecture, seminar</td>
</tr>
<tr>
<td>Vorkenntnisse / Previous knowledge</td>
<td>Basics in physiology and perception</td>
</tr>
<tr>
<td>Examination</td>
<td>Time of examination</td>
</tr>
<tr>
<td></td>
<td>Type of examination</td>
</tr>
<tr>
<td>Final exam of module</td>
<td>end of semester</td>
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<tr>
<td></td>
<td>written exam</td>
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<td>Comment</td>
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<td></td>
<td>SWS</td>
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<tr>
<td></td>
<td>Frequency</td>
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<tr>
<td></td>
<td>Workload attendance</td>
</tr>
<tr>
<td>Lecture</td>
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<tr>
<td>Seminar</td>
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<td>56 h</td>
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bio416 - Experiments in Neurobiology II

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<tr>
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<th>Experiments in Neurobiology II</th>
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<tbody>
<tr>
<td>Module code</td>
<td>bio416</td>
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<tr>
<td>Credit points</td>
<td>6.0 KP</td>
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<tr>
<td>Workload</td>
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**Used in course of study**
- Fach-Bachelor Biologie > Akzentsetzungsmodule
- Fach-Bachelor Mathematik > Nebenfachmodule
- Master of Education (Gymnasium) Biologie > Mastermodule
- Zwei-Fächer-Bachelor Biologie > Akzentsetzungsmodule

**Contact person**
- Module responsibility
  - Georg Martin Klump
- Authorized examiners
  - Georg Martin Klump
  - Christiane Margarete Thiel
  - Ulrike Langemann
- Module counseling
  - Christiane Margarete Thiel
  - Ulrike Langemann

**Entry requirements**
- bio415 "Introduction to Neurobiology II"

**Skills to be acquired in this module**
- **++** deepened biological expertise
- **++** deepened knowledge of biological working methods
- **++** data analysis skills
- **+** data presentation and discussion in German and English (written and spoken)
- **+** teamwork
- **+** scientific/mathematical basic knowledge relevant for biology

**Module contents**
The exercise immediately follows the module "Introduction to Neurobiology II". By experimenting with each other, the students deepen their knowledge in the fields of cognitive neuroscience and hearing science. The students analyze their own data (incl. statistics) and present these in a written report.

**Reader's advisory**

**Links**
- Language of instruction: German
- Duration (semesters): 1 Semester
- Module frequency: annually
- Module capacity: 30
- Module level: AS (Akzentsetzung / Accentuation)
- Module type: Wahlpflicht / Elective
- Lern-/Lehrform / Type of program: exercise
- Vorkenntnisse / Previous knowledge: Neurobiology II

<table>
<thead>
<tr>
<th>Examination</th>
<th>Type of examination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Final exam of module</td>
<td>end of module portfolio (data analysis, presentation)</td>
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**Course type**
- Exercises

<table>
<thead>
<tr>
<th>SWS</th>
<th>Frequency</th>
<th>Workload attendance</th>
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<tbody>
<tr>
<td>4.00</td>
<td>WiSe</td>
<td>56 h</td>
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</table>
bio420 - Biochemistry of the Cell

Module label: Biochemistry of the Cell
Module code: bio420
Credit points: 6.0 KP
Workload: 180 h

Used in course of study:
- Fach-Bachelor Biologie > Akzentsetzungsmodule
- Master of Education (Gymnasium) Biologie > Mastermodule
- Zwei-Fächer-Bachelor Biologie > Akzentsetzungsmodule

Contact person:
Module responsibility: Alexander Scholten
Authorized examiners: Alexander Scholten

Entry requirements:
Skills to be acquired in this module:
++ biological knowledge
+ knowledge of biological working methods
+ biologically relevant knowledge in the natural sciences and mathematics
+ abstract, logical, analytical thinking
+ data presentation and evidence-based discussion (written and spoken)
++ (scientific) communication skills

Module contents:
supramolecular organization in the cell, interactions of biomolecules, signalling fluxes

Reader's advisory:
Biochemie, Müller-Esterl
Biochemie, Lubert Stryer
Lehninger Prinzipien der Biochemie, David L. Nelson und Michael M. Cox
Principles of Biochemistry, Horton et al.

Links:
Language of instruction: German
Duration (semesters): 1 Semester
Module frequency: annually
Module capacity: 20
Modullevel: AS (Akzentsetzung / Accentuation)
Modulart: Wahlpflicht / Elective
Lern-/Lehrform / Type of program: lecture, seminar, exercise
Vorkenntnisse / Previous knowledge: Biochemistry

Examination:
<table>
<thead>
<tr>
<th>Course type</th>
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<th>Type of examination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecture</td>
<td>during the semester</td>
<td>oral presentation</td>
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<tr>
<td>Exercises</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seminar</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Workload attendance:
- Lecture: 1.00 SWS, WiSe, 14 h
- Exercises: 1.00 SWS, WiSe, 14 h
- Seminar: 2.00 SWS, WiSe, 28 h

Total time of attendance for the module: 56 h
bio430 - Analytical Biochemistry

Module label: Analytical Biochemistry
Module code: bio430
Credit points: 6.0 KP
Workload: 180 h

Used in course of study:
- Fach-Bachelor Biologie > Akzentsetzungsmodule
- Master of Education (Gymnasium) Biologie > Mastermodule
- Zwei-Fächer-Bachelor Biologie > Akzentsetzungsmodule

Contact person:
- Module responsibility: Karl-Wilhelm Koch
- Authorized examiners: Alexander Scholten, Karl-Wilhelm Koch
- Module counseling: Alexander Scholten

Entry requirements:
Skills to be acquired in this module:
- ++ biological knowledge
- ++ knowledge of biological working methods
- + biologically relevant knowledge in the natural sciences and mathematics
- + abstract, logical, analytical thinking
- + deepened expertise in biological specialist field
- ++ data presentation and evidence-based discussion (written and spoken)
- + teamwork

The students get a survey of current techniques in Biochemistry and learn some essential techniques such as column chromatography and enzyme kinetic measurements in practice. They understand the theoretical fundamentals of these techniques and assess experimentally collected data bases.

Module contents:
- Bioanalytical methods in theory and practice

Reader's advisory:
- Bioanalytik, Lottspeich/Engels

Language of instruction: German

Duration (semesters): 1 Semester

Module frequency: annually

Module capacity: 20

Modullevel: PB (Professionalisierungsbereich / Professionalization)

Modulart: Ergänzung/Professionalisierung

Lern-/Lehrform / Type of program:
- lecture, seminar, exercise

Vorkenntnisse / Previous knowledge:
- Biochemistry and Molecular Biology

Examination:

<table>
<thead>
<tr>
<th>Course type</th>
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<th>Type of examination</th>
<th>Final exam of module</th>
<th>Course type</th>
<th>Comment</th>
<th>SWS</th>
<th>Frequency</th>
<th>Workload attendance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecture</td>
<td>during semester</td>
<td>oral presentation and protocol</td>
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<td></td>
<td></td>
<td>1.00</td>
<td>SuSe</td>
<td>14 h</td>
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<tr>
<td>Seminar</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1.00</td>
<td>SuSe</td>
<td>14 h</td>
</tr>
<tr>
<td>Exercises</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2.00</td>
<td>SuSe</td>
<td>28 h</td>
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Total time of attendance for the module: 56 h
bio440 - Microfauna, Microflora & Protista of limnic and marine habitats

Module label: Microfauna, Microflora & Protista of limnic and marine habitats
Module code: bio440
Credit points: 6.0 KP
Workload: 180 h

Used in course of study:
- Fach-Bachelor Biologie > Akzentsetzungsmodule
- Master of Education (Gymnasium) Biologie > Mastermodule
- Zweifächer-Bachelor Biologie > Akzentsetzungsmodule

Contact person:
Module responsibility: Wilko Ahlrichs
Authorized examiners:
- Wilko Ahlrichs
- Alexander Kieneke
- Mona Hoppenrath
Module counseling:
- Alexander Kieneke
- Mona Hoppenrath

Entry requirements:
Skills to be acquired in this module:
++ biological knowledge
++ knowledge of biological working methods
++ biologically relevant knowledge in the natural sciences and mathematics
* statistics & scientific programming
++ interdisciplinary knowledge & thinking
* abstract, logical, analytical thinking
++ deepened expertise in biological specialist field
++ independent learning and (research-based) working
++ data presentation and evidence-based discussion (written and spoken)
+ teamwork
++ (scientific) communication skills
+ project and time management

The objectives of the module are the teaching and learning of methods in the field of taxonomy, systematics, morphology, ecology, and evolution. Competences for finding, identifying, preparing, micro-copying, illustrating, describing, and publishing species are taught. It learns how a scientific collection is created and managed. Another goal is the teaching of basics of molecular systematics and barcoding.

The focus is on taxa of the microfauna and protists of limnic and marine habitats. The goal is the knowledge of biotic and abiotic properties of aquatic habitats, their formation and biodiversity. The students should learn to hypothesize structural adaptations of organisms to aquatic habitats.

Module contents:
We study microfauna and protists of limnic and marine habitats. Microfauna refers to microscopic animals. They live together with protists aquatic habitats in high diversity. Animals of the microfauna and protists usually belong to groups that developed early in evolution. The study of communities of these groups give a unique insight into the evolution of animals and protists. The microfauna and the protists are little studied compared to other groups of animals and offer great potential. But they must be examined under the optical microscope. This requires special techniques and knowledge. Fortunately, through digital techniques, the investigation and publications have been greatly simplified. We will make excursions to ponds, ponds, lakes, rivers, bogs, sea beaches, etc. It teaches where, when, and how to find species of microfauna and protists. The collected organisms are determined, prepared, microscoped, photographed, drawn, and digitally illustrated. Art descriptions are produced. Attention is paid to the correct application of nomenclature rules. We show how a scientific collection is built and managed. For this purpose, basic knowledge in SQL database technology is taught. Dichotomous, synoptic, and digital identification keys are presented and developed.

In addition to the classical morphological methods, it will be shown how species for molecular barcoding and phylogenetic analyzes are investigated. The students will create art portraits. The results are communicated in the form of posters, short lectures, and scientific publications.

Reader's advisory:
Will be announced in the course.

Links:
Language of instruction: German
Duration (semesters): 1 Semester
Module frequency: irregular
Module capacity: 12

For more applicants than places, a motivation letter decides on the admission.

...
| Modullevel | --- |
| Modulart | je nach Studiengang Pflicht oder Wahlpflicht |

### Lern-/Lehrform / Type of program

<table>
<thead>
<tr>
<th>Vorkenntnisse / Previous knowledge</th>
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<tbody>
<tr>
<td>Examination</td>
<td>Time of examination</td>
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<tr>
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</tr>
<tr>
<td>Seminar</td>
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<tr>
<td>Exercises</td>
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#### Final exam of module

<table>
<thead>
<tr>
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<th>Comment</th>
<th>SWS</th>
<th>Frequency</th>
<th>Workload attendance</th>
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</thead>
<tbody>
<tr>
<td>Study trip</td>
<td></td>
<td>1.00</td>
<td>SuSe</td>
<td>14 h</td>
</tr>
<tr>
<td>Seminar</td>
<td></td>
<td>1.00</td>
<td>SuSe</td>
<td>14 h</td>
</tr>
<tr>
<td>Exercises</td>
<td></td>
<td>2.00</td>
<td>SuSe</td>
<td>28 h</td>
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</table>

**Total time of attendance for the module**

56 h
bio450 - Posters, Pictures, Presentations and Papers

Module label: Posters, Pictures, Presentations and Papers
Module code: bio450
Credit points: 9.0 KP
Workload: 270 h

Used in course of study:
- Fach-Bachelor Biologie > Akzentsetzungsmodule
- Master of Education (Gymnasium) Biologie > Mastermodule
- Zwei-Fächer-Bachelor Biologie > Akzentsetzungsmodule

Contact person:
Module responsibility: Olaf Bininda-Emonds
Authorised examiners:
- Olaf Bininda-Emonds
- Wilko Ahlrichs
Module counseling:
- Wilko Ahlrichs

Entry requirements:
Skills to be acquired in this module:
- Interdisciplinary knowledge & thinking
- Abstract, logical, analytical thinking
- Deepened expertise in biological specialist field
- Independent learning and (research-based) working
- Data presentation and evidence-based discussion (written and spoken)
- Scientific communication skills
- Project and time management
Practical experience with four forms of scientific presentation: papers, presentations, scientific drawings, and posters. The students will learn/gain: 1) the logical and structural form of a scientific paper (or protocol or thesis) so as to communicate their results more effectively; 2) the distillation of the key information out of a project and its focused presentation in a lecture or poster; 3) experience with constructive criticism in a group setting as well as the critical assessment of scientific studies; 4) experience with scientific English; and 5) the art of scientific drawing, including the making of high-quality photo montages for papers or posters through microphotography and digital editing.

Module contents:
Theoretical part: General tips regarding the logical and structural form of a scientific paper, presentation, or posters, including how to avoid making the most common mistakes.
Practical part: Critical analysis of selected papers from the (evolutionary biological) literature. Writing of a scientific paper using pre-given results. Construction and presentation of a lecture and poster in front of the group based on a recent paper from the literature. Through the feedback obtained in this process, improvements will be made in both cases. Microscopic photography of selected zoological specimens that will then be transferred to/drawn on transparent paper before being rescanned for digital editing. High-quality photo montages of both the photos themselves and the drawings derived from them will be obtained through diverse software (e.g., Adobe Illustrator or InDesign).

Reader’s advisory:
None. The relevant scientific literature will be distributed during the course.

Links:
Languages of instruction: German, English
Duration (semesters): 1 Semester
Module frequency: annually
Module capacity: 10
Modulelevel: AS (Akzentsetzung / Accentuation)
Modulart: Wahlpflicht / Elective
Lern-Lehrform / Type of program: exercise
Vorkenntnisse / Previous knowledge:
Experience with the use of Microsoft Excel (or programs with graphing capabilities), Adobe Photoshop, and Microsoft PowerPoint or Keynote (or similar programs).
Examination:
- Time of examination:
- Type of examination: Portfolio (100%)
Course type:
Exercises
<table>
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<tbody>
<tr>
<td>Frequency</td>
<td>SuSe</td>
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<tr>
<td>Workload attendance</td>
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bio460 - Diversity of marine Invertebrates

Module label: Diversity of marine Invertebrates
Module code: bio460
Credit points: 6.0 KP
Workload: 180 h

Used in course of study:
- Fach-Bachelor Biologie > Akzentsetzungsmodule
- Master of Education (Gymnasium) Biologie > Mastermodule
- Zwei-Fächer-Bachelor Biologie > Akzentsetzungsmodule

Contact person:
Module responsibility: Thomas Glatzel
Authorized examiners:
- Thomas Glatzel

Entry requirements:
Skills to be acquired in this module:
++ biological knowledge
+ knowledge of biological working methods
+ interdisciplinary knowledge & thinking
++ deepened expertise in biological specialist field
++ independent learning and (research-based) working
++ data presentation and evidence-based discussion (written and spoken)
+ teamwork
++ (scientific) communication skills
++ project and time management
+ knowledge of safety and environmental issues

By actively participating in this module the students acquire qualifications in the fields stated below:
- Survey of recent subjects concerning the biology and morphology of aquatic organisms
- Extended knowledge of how morphological characteristics have developed
- Technical skills in preparing and documenting morphological structures
- Knowledge of organizational principles of these structures

Module contents:
The module serves an extended examination of selected aquatic animals from a functional morphological point of view. Living and fixed animals are investigated and histological preparations are analysed. Thus, the morphology, anatomy, and histology are studied in detail. The biology and ecology of these animals are also considered, which enables the organisms to be studied very intensively and provides an illustrative basis for theoretical discussions.

Reader's advisory:
GRÜNER, H.-E., 1993: „Der Kästner“, A., Lehrbuch der speziellen Zoologie. All volumes, Gustav Fischer/Spektrum Akademischer Verlag, Jena, Stuttgart. Many interesting details are found only in these volumes!
GRÜTER, W., 2001: Leben im Meer – Vielfalt und Zusammenhänge. Dr. Friedrich Pfeil Verlag, München. This book arouses your curiosity about the underwater world.
HAYWARD, P. NELSON-SMITH, T., SHIELDS, C. & M. KREMER, 2008: Der neue Kosmos Strandführer - 1500 Arten der Küsten Europas. Franckh-Kosmos Verlag. This coastal guide provides excellent and clearly arranged colour tables for individual groups.
The literature listed above is available in the university library in Wechloy. Further reading will be recommended in the course of the lecture.

Literature inquiry:
web of science: http://rzblx10.uni-regensburg.de/dbinfo/dbliste.php?bib_id=ubol&colors=7&colors=40&lett=f&gebiete=5 – Data banks(DBIS) - Biology - TOPData banks e.g. ASFA, Science Citation Index, Zoological Record
http://www.biodiversitylibrary.org/bibliography/14107
http://scholar.google.de/
http://www.doaj.org/
Open access journals: http://www.doaj.org/ - www.plosone.org

Links:
Language of instruction: German
Duration (semesters): 1 Semester

58 / 85
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<thead>
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<th>Module frequency</th>
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<td>Modulart</td>
<td>Wahlpflicht / Elective</td>
</tr>
<tr>
<td>Lern-/Lehrform / Type of program</td>
<td>seminar, exercise</td>
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Vorkenntnisse / Previous knowledge

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<th>Examination</th>
<th>Time of examination</th>
<th>Type of examination</th>
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</thead>
<tbody>
<tr>
<td>Final exam of module</td>
<td>During the lecture</td>
<td>portfolio</td>
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PLEASE NOTE:
Additional conditions regarding attendance and ungraded activities as determined by the persons responsible for the module will apply.

<table>
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<tr>
<th>Course type</th>
<th>Comment</th>
<th>SWS</th>
<th>Frequency</th>
<th>Workload attendance</th>
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<tr>
<td>Exercises</td>
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<td>3.00</td>
<td>WiSe</td>
<td>42 h</td>
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<tr>
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<td>1.00</td>
<td>WiSe</td>
<td>14 h</td>
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</table>

Total time of attendance for the module 56 h
bio470 - Marine Biology Field Trip

Module label | Marine Biology Field Trip
---|---
Module code | bio470
Credit points | 6.0 KP
Workload | 180 h

Used in course of study
- Fach-Bachelor Biologie > Akzentsetzungsmodule
- Master of Education (Gymnasium) Biologie > Mastermodule
- Zwei-Fächer-Bachelor Biologie > Akzentsetzungsmodule

Contact person
- Module responsibility
  - Wilko Ahirichs
- Authorized examiners
  - Wilko Ahirichs
  - Alexander Kieneke
- Module counseling
  - Alexander Kieneke

Entry requirements
Skills to be acquired in this module
- ++ biological knowledge
- ++ knowledge of biological working methods
- ++ biologically relevant knowledge in the natural sciences and mathematics
- + statistics & scientific programming
- + interdisciplinary knowledge & thinking
- + abstract, logical, analytical thinking
- ++ deepened expertise in biological specialist field
- ++ independent learning and (research-based) working
- ++ data presentation and evidence-based discussion (written and spoken)
- + teamwork
- ++ (scientific) communication skills
- + project and time management

On completion of this module students will: have a basic knowledge of the diversity of marine life; understand the fundamental physiochemical and physiological processes underlying the productivity of marine environments; understand the ecological dynamics of marine ecosystems; appreciate the role of humans in disturbing and exploiting marine ecosystems; have developed a critical, analytical approach to scientific research; have developed skills in writing scientific reports and in oral communication of scientific information.

Module contents
Microscopy of marine fauna and flora of the wadden sea; Students are required plan and carry out a research project that exposes them to some of the challenges and problems encountered by field biologists - and some of the techniques that are used to solve these problems. Students have to present a scientific poster and a short oral presentation.

Reader's advisory
Will be announced in the course.

Links
- Language of instruction: German
- Duration (semesters): 1 Semester
- Module frequency: annually
- Module capacity: 14 (For more applicants than places, a letter of motivation decides on the admission.)
- Modulelevel: AS (Akzentsetzung / Accentuation)
- Modulart: Wahlpflicht / Elective
- Lern-/Lehrform / Type of program: seminar, exercise, excursion
- Vorkenntnisse / Previous knowledge

<table>
<thead>
<tr>
<th>Examination</th>
<th>Time of examination</th>
<th>Type of examination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Final exam of module</td>
<td>portfolio</td>
<td></td>
</tr>
<tr>
<td>Course type</td>
<td>Comment</td>
<td>SWS</td>
</tr>
<tr>
<td>Seminar</td>
<td></td>
<td>2.00</td>
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<tr>
<td>Exercises</td>
<td></td>
<td>2.00</td>
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<td>Study trip</td>
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bio480 - Functional Morphology of Plants

<table>
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<tr>
<td>Module code</td>
<td>bio480</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>Fach-Bachelor Biologie &gt; Akzentsetzungsmodule</td>
</tr>
<tr>
<td></td>
<td>Master of Education (Gymnasium) Biologie &gt; Mastermodule</td>
</tr>
<tr>
<td></td>
<td>Zwei-Fächer-Bachelor Biologie &gt; Akzentsetzungsmodul</td>
</tr>
<tr>
<td>Contact person</td>
<td>Module responsibility</td>
</tr>
<tr>
<td></td>
<td>Gerhard Wolfgang Zotz</td>
</tr>
<tr>
<td>Authorized examiners</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gerhard Wolfgang Zotz</td>
</tr>
<tr>
<td></td>
<td>Helena Einzmann</td>
</tr>
<tr>
<td>Module counseling</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Helena Einzmann</td>
</tr>
<tr>
<td>Entry requirements</td>
<td>Skills to be acquired in this module</td>
</tr>
<tr>
<td></td>
<td>++ biological knowledge</td>
</tr>
<tr>
<td></td>
<td>+ knowledge of biological working methods</td>
</tr>
<tr>
<td></td>
<td>+ biologically relevant knowledge in the natural sciences and mathematics</td>
</tr>
<tr>
<td></td>
<td>+ interdisciplinary knowledge &amp; thinking</td>
</tr>
<tr>
<td></td>
<td>+ abstract, logical, analytical thinking</td>
</tr>
<tr>
<td></td>
<td>++ deepened expertise in biological specialist field</td>
</tr>
<tr>
<td></td>
<td>+ independent learning and (research-based) working</td>
</tr>
<tr>
<td>Students acquire knowledge in macroscopic and microscopic morphology of plants, always putting form in the context of function</td>
<td></td>
</tr>
<tr>
<td>Students understand the concepts of allometry and scaling</td>
<td></td>
</tr>
<tr>
<td>Students put this knowledge in the context of theoretical concepts of ecology and evolution</td>
<td></td>
</tr>
<tr>
<td>Students learn experimental techniques in diverse topics, e.g. biomechanics or water relations</td>
<td></td>
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<tr>
<td>Module contents</td>
<td>V: Functional Morphology of Plants (1 SWS)</td>
</tr>
<tr>
<td></td>
<td>E: Mikroskopy, biomechanical Experiments, Form/Function Experiments regarding water uptake, storage and loss (2 SWS)</td>
</tr>
<tr>
<td></td>
<td>S new studies in the field of functional morphology (1 SWS)</td>
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<td>Links</td>
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<td>Language of instruction</td>
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<td>Duration (semesters)</td>
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<tr>
<td>Module frequency</td>
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<td>AS (Akzentsetzung / Accentuation)</td>
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<td>Modulart</td>
<td>Wahlpflicht / Elective</td>
</tr>
<tr>
<td>Lern-/Lehrform / Type of program</td>
<td>lecture, seminar, exercise</td>
</tr>
<tr>
<td>Vorkenntnisse / Previous knowledge</td>
<td>Ecology, Flora</td>
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<table>
<thead>
<tr>
<th>Examination</th>
<th>Time of examination</th>
<th>Type of examination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Final exam of module</td>
<td>1 Portfolio (oral presentation and 1 report)</td>
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<tr>
<td>Course type</td>
<td>Comment</td>
<td>SWS</td>
</tr>
<tr>
<td>Lecture</td>
<td>1.00</td>
<td>SuSe</td>
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<tr>
<td>Seminar</td>
<td>1.00</td>
<td>SuSe</td>
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<tr>
<td>Exercises</td>
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<td>SuSe</td>
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<td>Total time of attendance for the module</td>
<td>56 h</td>
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### bio320 - Pollination and Dispersal Biology

<table>
<thead>
<tr>
<th>Module label</th>
<th>Pollination and Dispersal Biology</th>
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</thead>
<tbody>
<tr>
<td>Module code</td>
<td>bio320</td>
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<tr>
<td>Credit points</td>
<td>15.0 KP</td>
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<tr>
<td>Workload</td>
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</table>

#### Used in course of study
- Fach-Bachelor Biologie > Akzentsetzungsmodule
- Master of Education (Gymnasium) Biologie > Mastermodule
- Zwei-Fächer-Bachelor Biologie > Akzentsetzungsmodule

#### Contact person
- Module responsibility
  - Dirk Carl Albach
- Authorized examiners
  - Dirk Carl Albach
  - Klaus Bernhard von Hagen
- Module counseling
  - Klaus Bernhard von Hagen

#### Entry requirements
- Skills to be acquired in this module
  + biological knowledge
  + knowledge of biological working methods
  + abstract, logical, analytical thinking
  + deepened expertise in biological specialist field
  + independent learning and (research-based) working
  + data presentation and evidence-based discussion (written and spoken)
  + teamwork
  + (scientific) communication skills
  + project and time management
  + knowledge of safety and environmental issues

- Extended knowledge of biodiversity and evolution of plants focusing on reproduction, dispersal, germination and establishment of plants

#### Module contents
- **L:** Pollination, dispersal, germination of plants, plant breeding
- **S:** Pollination and dispersal biology of plants in a systematic context
- **LC:** Pollination, fertilisation, dispersal and germination biological experiments in regard of adaptation to environmental factors

#### Reader's advisory
The course does not follow a special textbook. The following German literature is recommended to students interested in the course: Dieter Heß – Die Blüte, Eugen Ulmer Verlag as well as Leins & Erbar -Blüte und Frucht, Schweizerbart'sche Verlagsbuchhandlung.

#### Links
- **Language of instruction:** German
- **Duration (semesters):** 1 Semester
- **Module frequency:** jährlich
- **Module capacity:** unlimited
- **Modullevel:** AS (Akzentsetzung / Accentuation)
- **Modulart:** Wahlpflicht / Elective

#### Vorkenntnisse / Previous knowledge

<table>
<thead>
<tr>
<th>Examination</th>
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</thead>
<tbody>
<tr>
<td>Final exam of module</td>
<td>Four weeks after the end of the exercises at the latest.</td>
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1 Portfolio

**PLEASE NOTE:**
Additional conditions regarding attendance and ungraded activities as determined by the persons responsible for the module will apply.

<table>
<thead>
<tr>
<th>Course type</th>
<th>Comment</th>
<th>SWS</th>
<th>Frequency</th>
<th>Workload attendance</th>
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<tbody>
<tr>
<td>Lecture</td>
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<td>Seminar</td>
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<td>Practical</td>
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<td>70 h</td>
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**Total time of attendance for the module:** 112 h
bio350 - Organismic Microanatomy

Module label: Organismic Microanatomy
Module code: bio350
Credit points: 15.0 KP
Workload: 450 h

Used in course of study:
- Fach-Bachelor Biologie > Akzentsetzungsmodule
- Master of Education (Gymnasium) Biologie > Mastermodule
- Zwei-Fächer-Bachelor Biologie > Akzentsetzungsmodule

Contact person:
Module responsibility
- Wilko Ahlrichs

Authorized examiners
- Wilko Ahlrichs
- Mona Hoppenrath
- Alexander Kieneke

Module counseling
- Mona Hoppenrath
- Alexander Kieneke

Entry requirements:
Skills to be acquired in this module:
- ++ biological knowledge
- ++ knowledge of biological working methods
- ++ biologically relevant knowledge in the natural sciences and mathematics
- + interdisciplinary knowledge & thinking
- ++ abstract, logical, analytical thinking
- ++ deepened expertise in biological specialist field
- ++ independent learning and (research-based) working
- ++ data presentation and evidence-based discussion (written and spoken)
- + teamwork
- ++ (scientific) communication skills
- + project and time management
- + knowledge of safety and environmental issues

Module contents
Reader's advisory

Links

Language of instruction: German

Duration (semesters): 1 Semester

Module frequency: jährlich

Module capacity: unlimited

Modullevel: AS (Akzentsetzung / Accentuation)

Modulart: Wahlpflicht / Elective

Lern-/Lehrform / Type of program

Vorkenntnisse / Previous knowledge

Examination:
- Time of examination
- Type of examination

Final exam of module:
- Bachelor: 1 Portfolio
- Master of Education: 1 oral exam

Course type:
- Lecture: 3.00 SWS, 42 h workload
- Exercises: 5.00 SWS, 70 h workload
- Study trip: 1.00 SWS, 14 h workload

Total time of attendance for the module: 126 h
The module comprises a lecture in the Botanical Garden, where plants will be observed and investigated. This includes algae, bryophytes, ferns, gymnosperms and various families of angiosperms. The seminar is intended to let students study in-depth additional plant families with their typical characters. The exercises will be used to apply the abilities to plant species in the vicinity of Oldenburg and to practice methods in mapping and surveying plant species.

The module is intended to give students in-depth knowledge on plant determination and the diversity of plants. Students shall increase their knowledge on species and learn and improve their abilities in plant determination and plant conservation.

The module comprises a lecture in the Botanical Garden, where plants will be observed and investigated. This includes algae, bryophytes, ferns, gymnosperms and various families of angiosperms. The seminar is intended to let students study in-depth additional plant families with their typical characters. The exercises will be used to apply the abilities to plant species in the vicinity of Oldenburg and to practice methods in mapping and surveying plant species.

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### bio380 - Specific Microbiology

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<tr>
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<th>Specific Microbiology</th>
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<td>Workload</td>
<td>450 h</td>
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<td>Used in course of study</td>
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</tr>
<tr>
<td></td>
<td>Fach-Bachelor Biologie &gt; Akzentsetzungsmodul</td>
</tr>
<tr>
<td></td>
<td>Master of Education (Gymnasium) Biologie &gt; Mastermodule</td>
</tr>
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<td>Zwei-Fächer-Bachelor Biologie &gt; Akzentsetzungsmodul</td>
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<tr>
<td>Contact person</td>
<td>Module responsibility</td>
</tr>
<tr>
<td></td>
<td>Ralf Andreas Rabus</td>
</tr>
<tr>
<td></td>
<td>Kathleen Trautwein</td>
</tr>
<tr>
<td>Authorized examiners</td>
<td></td>
</tr>
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<td>Ralf Andreas Rabus</td>
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<td>Kathleen Trautwein</td>
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<td>Entry requirements</td>
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<td>Skills to be acquired in this module</td>
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</tr>
<tr>
<td></td>
<td>++ biological knowledge</td>
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<tr>
<td></td>
<td>++ knowledge of biological working methods</td>
</tr>
<tr>
<td></td>
<td>++ biologically relevant knowledge in the natural sciences and mathematics</td>
</tr>
<tr>
<td></td>
<td>++ interdisciplinary knowledge &amp; thinking</td>
</tr>
<tr>
<td></td>
<td>++ abstract, logical, analytical thinking</td>
</tr>
<tr>
<td></td>
<td>++ deepened expertise in biological specialist field</td>
</tr>
<tr>
<td></td>
<td>++ independent learning and (research-based) working</td>
</tr>
<tr>
<td></td>
<td>++ data presentation and evidence-based discussion (written and spoken)</td>
</tr>
<tr>
<td></td>
<td>++ teamwork</td>
</tr>
<tr>
<td></td>
<td>++ project and time management</td>
</tr>
<tr>
<td></td>
<td>++ knowledge of safety and environmental issues</td>
</tr>
<tr>
<td>Emphasis on:</td>
<td>Theory: Different cultivation strategies (batch, fed-batch, continuous) and physiological interpretation of measuring parameters (growth rates, respiration rates, yield)</td>
</tr>
<tr>
<td></td>
<td>Practice: Knowledge of device and handling of bioreactors including sensor systems</td>
</tr>
<tr>
<td>Module contents</td>
<td>Fundamentals of process-controlled cultivation in bioreactors</td>
</tr>
<tr>
<td></td>
<td>Part A: Handling of bioreactors, determination of the kLa value (oxygen yield rate)</td>
</tr>
<tr>
<td></td>
<td>Part B: Cultivation of marine bacteria under controlled conditions in a bioreactor, balance of metabolic activities</td>
</tr>
<tr>
<td>Reader's advisory</td>
<td>Schmauder HP (1994) Methoden der Biotechnologie, Kapitel 3.2.2. Gustav Fischer Verlag Jena</td>
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<td>Links</td>
<td><a href="http://www.icbm.de/ammb/index.html">www.icbm.de/ammb/index.html</a></td>
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<td>Duration (semesters)</td>
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<tr>
<td>Module frequency</td>
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<tr>
<td>Module capacity</td>
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<td>Module level</td>
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<td>Modulart</td>
<td>Wahlpflicht / Elective</td>
</tr>
<tr>
<td>Lern-/Lehrform / Type of program</td>
<td></td>
</tr>
<tr>
<td>Examination</td>
<td>Time of examination</td>
</tr>
<tr>
<td>Final exam of module</td>
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<tr>
<td></td>
<td>Type of examination</td>
</tr>
<tr>
<td></td>
<td>1 written examination (50%)</td>
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<tr>
<td></td>
<td>1 record (50%)</td>
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<tr>
<td>Workload attendance</td>
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<table>
<thead>
<tr>
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<th>Comment</th>
<th>SWS</th>
<th>Frequency</th>
<th>Workload attendance</th>
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<tbody>
<tr>
<td>Lecture</td>
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<td>4.00</td>
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<td>Exercises</td>
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<td>6.00</td>
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<td>Frequency</td>
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<tr>
<td>Seminar</td>
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<td>140 h</td>
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**Total time of attendance for the module** 140 h
bio400 - Basic Concepts in Neurobiology I

Module label: Basic Concepts in Neurobiology I
Module code: bio400
Credit points: 15.0 KP
Workload: 450 h

Used in course of study:
- Fach-Bachelor Biologie > Akzentsetzungsmodule
- Fach-Bachelor Mathematik > Nebenfachmodule
- Master of Education (Gymnasium) Biologie > Mastermodule
- Zwei-Fächer-Bachelor Biologie > Akzentsetzungsmodule

Contact person
Module responsibility:
- Martin Greschner
- Karl-Wilhelm Koch

Authorized examiners:
- Martin Greschner
- Karl-Wilhelm Koch
- Ulrike Janssen-Bienhold

Module counseling:
- Ulrike Janssen-Bienhold
- Christiane Richter-Landsberg
- Olaf Goldbaum

Entry requirements
Skills to be acquired in this module:
++ biological knowledge
++ knowledge of biological working methods
+ abstract, logical, analytical thinking
+ deepened expertise in biological specialist field
+ data presentation and evidence-based discussion (written and spoken)

Imparting basic knowledge and relations of neurobiology. Transfer achievement: Preparing scientific records from the results of independent experiments.

Module contents
In its first part, the lecture (4 H/W) covers the molecular and cellular fundamentals of neurobiology, the electrical processes in nervous cells, the organization and development of the nervous system, its function explained by simple circuits as well as the sensorimotor integration underlying any behaviour.
In the seminar (1 H/W), individual subjects of the lecture are consolidated. In the subsequent block laboratory course (6 H/W), this theoretical knowledge is verified under real-world conditions by simple experiments related to the subjects dealt with in the lecture. Unobjectionable scientific minutes are to be prepared of the experiments and the individual results are to be presented in a seminar paper.

Reader's advisory

Links
Language of instruction: German
Duration (semesters): 1 Semester
Module frequency: jährlich
Module capacity: unlimited
Modullevel: AS (Akzentsetzung / Accentuation)
Modulart: Wahlpflicht / Elective

Lern-/Lehrform / Type of program

Vorkenntnisse / Previous knowledge

Examination Time of examination Type of examination
Final exam of module
1 written examination, signed minutes
PLEASE NOTE:
Additional conditions regarding attendance and ungraded activities as determined by the persons responsible for the module will apply.

Course type Comment SWS Frequency Workload attendance
Lecture
4.00
56 h
Exercises
6.00
84 h
<table>
<thead>
<tr>
<th>Course type</th>
<th>Comment</th>
<th>SWS</th>
<th>Frequency</th>
<th>Workload attendance</th>
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<tbody>
<tr>
<td>Tutorial</td>
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**Total time of attendance for the module**  
182 h
bio410 - Basic Concepts in Neurobiology II

Module label: Basic Concepts in Neurobiology II
Module code: bio410
Credit points: 15.0 KP
Workload: 450 h

Used in course of study:
- Fach-Bachelor Biologie > Akzentsetzungsmodule
- Master of Education (Gymnasium) Biologie > Mastermodule
- Zwei-Fächer-Bachelor Biologie > Akzentsetzungsmodul

Contact person:
Module responsibility:
- Georg Martin Klump

Authorized examiners:
- Georg Martin Klump
- Ulrike Langemann
- Christiane Margarete Thiel
- Christine Köppl

Module counceling:
- Ulrike Langemann
- Christiane Margarete Thiel
- Christine Köppl

Entry requirements:

Skills to be acquired in this module:
- ++ biological knowledge
- ++ knowledge of biological working methods
- abstract, logical, analytical thinking
- deepened expertise in biological specialist field
- data presentation and evidence-based discussion (written and spoken)

Basic knowledge and relations of sensory science, cognition, and motor functions are imparted. Transfer achievement: Presentation of personal experimental results.

Module contents:
The lecture covers the anatomy and function of simple sensory and motory systems as well as higher cognitive functions. Selected subjects are treated in more detail in the seminar. In the subsequent block practical course, this theoretical knowledge is verified under real-world conditions by simple experiments related to the subjects dealt with in the lecture including data analysis and presentation of results.

Reader's advisory:

Links:

Language of instruction: German
Duration (semesters): 1 Semester
Module frequency: jährlich
Module capacity: unlimited
Modulelevel: AS (Akzentsetzung / Accentuation)
Modulart: Wahlpflicht / Elective

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

Examination Time of examination Type of examination
Final exam of module Written examination in the course of the semester vacation (usually in March) 1 written examination

PLEASE NOTE: Additional conditions regarding attendance and ungraded activities as determined by the persons responsible for the module will apply.

Course type Comment SWS Frequency Workload attendance
Lecture 4.00
Exercises 5.00
Seminar 1.00

Total time of attendance for the module 140 h
bio390 - Plant molecular biology and genetics

<table>
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<tr>
<th>Module label</th>
<th>Plant molecular biology and genetics</th>
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<tbody>
<tr>
<td>Module code</td>
<td>bio390</td>
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<td>15.0 KP</td>
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<tr>
<td>Workload</td>
<td>450 h</td>
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| Used in course of study | - Fach-Bachelor Biologie > Akzentsetzungsmodule  
|                     | - Master of Education (Gymnasium) Biologie > Mastermodule  
|                     | - Zwei-Fächer-Bachelor Biologie > Akzentsetzungsmodule  |
| Contact person     | Sascha Laubinger                     |
| Module responsibility | - Sascha Laubinger  
| Authorized examiners | - Sascha Laubinger  |
| Entry requirements |                                      |
| Skills to be acquired in this module |                        |
| Module contents    |                                      |
| Reader's advisory  |                                      |
| Languages of instruction | German, English  |
| Duration (semesters) | 1 Semester  |
| Module frequency   |                                      |
| Module capacity    | 12 (16)                               |
| Modulart           | je nach Studiengang Pflicht oder Wahlpflicht  |
| Lern-/Lehrform / Type of program |                        |
| Vorkenntnisse / Previous knowledge |                        |

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<thead>
<tr>
<th>Examination</th>
<th>Type of examination</th>
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<tr>
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<td>Comment</td>
<td>SWS</td>
</tr>
<tr>
<td>Lecture</td>
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<td>WiSe</td>
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<tr>
<td>Seminar</td>
<td>3.00</td>
<td>WiSe</td>
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<tr>
<td>Practical</td>
<td>4.00</td>
<td>WiSe</td>
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<td>Total time of attendance for the module</td>
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Naturwissenschaftliche Grundlagen

bio150 - Statistics for Biologists

<table>
<thead>
<tr>
<th>Module label</th>
<th>Statistics for Biologists</th>
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<tbody>
<tr>
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<td>Credit points</td>
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</tr>
<tr>
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<td>Jutta Kretzberg</td>
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<tr>
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</tr>
<tr>
<td></td>
<td>knowledge of biological working methods</td>
</tr>
<tr>
<td></td>
<td>biologically relevant knowledge in the natural sciences and mathematics</td>
</tr>
<tr>
<td></td>
<td>statistics &amp; scientific programming</td>
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<td></td>
<td>interdisciplinary knowledge &amp; thinking</td>
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<tr>
<td></td>
<td>abstract, logical, analytical thinking</td>
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<tr>
<td></td>
<td>independent learning and (research-based) working</td>
</tr>
<tr>
<td></td>
<td>data presentation and evidence-based discussion (written and spoken)</td>
</tr>
<tr>
<td></td>
<td>teamwork</td>
</tr>
<tr>
<td>Knowledge in applied statistics</td>
<td></td>
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<tr>
<td>Basic knowledge of programming language R</td>
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<tr>
<td>Ability to plan, conduct and interpret statistical analysis of biological data</td>
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<tr>
<td>Module contents</td>
<td>Introduction to applied statistics - background and application in R:</td>
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<tr>
<td></td>
<td>Logic, set theory, combinatorics, probability theory, distributions, descriptive statistics, inferential statistics, statistical tests, ANOVA, study design, Bayes' statistics, correlation, regression, curve fitting</td>
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<td>A detailed script for lecture and exercises is available in Stud.IP</td>
</tr>
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<td>Duration (semesters)</td>
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<td>Modulart</td>
<td>Pflicht / Mandatory</td>
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<td>lecture, excercise</td>
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<td>Vorkenntnisse / Previous knowledge</td>
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<td>Examination Time of examination</td>
<td>Type of examination</td>
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<td>within two weeks after lecture time</td>
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<td>Exercises</td>
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bio251 - Exercises in Biochemistry and Molecular Biology

Module label: Exercises in Biochemistry and Molecular Biology
Module code: bio251
Credit points: 6.0 KP
Workload: 180 h

Used in course of study:
- Fach-Bachelor Biologie > Naturwissenschaftliche Grundlagen
- Zwei-Fächer-Bachelor Biologie > Ergänzungsmodulle

Contact person
- Module responsibility
  - Alexander Scholten
  - Karl-Wilhelm Koch
- Authorized examiners
  - Alexander Scholten
  - Karl-Wilhelm Koch
  - Sascha Laubinger
  - Arne Nolte
- Module counseling
  - Sascha Laubinger
  - Arne Nolte

Entry requirements: admission of BSc students in Biology

Skills to be acquired in this module:
+ biological knowledge
+ knowledge of biological working methods
+ biologically relevant knowledge in the natural sciences and mathematics
+ abstract, logical, analytical thinking
+ data presentation and evidence-based discussion (written and spoken)
+ teamwork
+ knowledge of safety and environmental issues

Module contents:
- General introduction to principles of laboratory work in Biochemistry and Cell Biology

Reader's advisory:
Script

Language of instruction: German

Duration (semesters): 1 Semester

Module frequency:

Module capacity: unlimited

Module level: EB (Ergänzungsbereich / Complementary)

Module type: Pflicht / Mandatory

Vorkenntnisse / Previous knowledge:
Biochemistry and Cell Biology

Examination:
- Final exam of module during semester written exam; additionally ungraded protocols

Course type | Comment | SWS | Frequency | Workload attendance |
--- | --- | --- | --- | --- |
Seminar |  | 1.00 | SuSe | 14 h |
Exercises |  | 3.00 | SuSe | 42 h |

Total time of attendance for the module: 56 h
che101 - Basic Chemistry

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<td>Fach-Bachelor Biologie &gt; Naturwissenschaftliche Grundlagen</td>
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<td></td>
<td>Fach-Bachelor Mathematik &gt; Nebenfachmodule</td>
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<td>Zwei-Fächer-Bachelor Biologie &gt; Ergänzungsmodule</td>
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<td></td>
<td>Oliver Janka</td>
</tr>
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<td></td>
<td>Authorized examiners</td>
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<td></td>
<td>Alle hier genannten</td>
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<td>Module counseling</td>
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<tr>
<td></td>
<td>Thomas Müller</td>
</tr>
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<td>Rüdiger Beckhaus</td>
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<td>Entry requirements</td>
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<td></td>
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<tr>
<td>Module contents</td>
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<td>Reader's advisory</td>
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<td>Pflicht/Wahlpflicht *</td>
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<td>Vorkenntnisse / Previous knowledge</td>
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<td>Examination</td>
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<td>Frequency</td>
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che102 - Basic Chemistry Laboratory

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**Used in course of study**
- Fach-Bachelor Biologie > Naturwissenschaftliche Grundlagen
- Fach-Bachelor Mathematik > Nebenfachmodule
- Zwei-Fächer-Bachelor Biologie > Ergänzungsmodule

**Contact person**
- Module responsibility
  - Oliver Janka
  - Rainer Koch
- Authorized examiners
  - Alle hier genannten

**Entry requirements**

**Skills to be acquired in this module**

**Module contents**

**Reader's advisory**

**Links**

**Language of instruction**
- German

**Duration (semesters)**
- 1 Semester

**Module frequency**
- jährlich

**Module capacity**
- unlimited

**Modullevel**
- BC (Basicscurriculum)

**Modulart**
- Pflicht/Wahlpflicht *

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

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**Course type**
- Seminar

**SWS**

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**Workload attendance**
- 0 h
# che190 - Basic Organic Chemistry

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<tr>
<td>Workload</td>
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**Used in course of study**
- Fach-Bachelor Biologie > Naturwissenschaftliche Grundlagen
- Fach-Bachelor Chemie > Aufbaumodule
- Master of Education (Sonderpädagogik) Chemie > Mastermodule
- Master of Education (Wirtschaftspädagogik) Chemie > Mastermodule
- Zwei-Fächer-Bachelor Biologie > Ergänzungsmodule
- Zwei-Fächer-Bachelor Chemie > Aufbaumodule

**Contact person**
- **Module responsibility**
  - Jens Christoffers
- **Authorized examiners**
  - Sven Doye
  - Jens Christoffers
  - Gerhard Hilt
- **Module counseling**
  - Sven Doye
  - Gerhard Hilt
  - Jens Christoffers

**Entry requirements**

**Skills to be acquired in this module**

**Module contents**

**Reader's advisory**

**Links**

**Language of instruction**
- German

**Duration (semesters)**
- 1 Semester

**Module frequency**
- jährlich

**Module capacity**
- unlimited

**Modullevel**
- AC (Aufbaucurriculum)

**Modulart**
- Pflicht

**Lern-Lehrform / Type of program**

**Vorkenntnisse / Previous knowledge**

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**Course type**
- Lecture

**SWS**
- 0.00

**Frequency**
- WiSe

**Workload attendance**
- 0 h
**che290 - Experimental Organic Chemistry**

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<td>Zwei-Fächer-Bachelor Chemie &gt; Aufbaumodule</td>
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<td>Jürgen Martens</td>
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<td>Jens Christoffers</td>
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<td>Entry requirements</td>
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<td>Skills to be acquired in this module</td>
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<td>Reader's advisory</td>
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<td>Duration (semesters)</td>
<td>1 Semester</td>
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<td>Module capacity</td>
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<td>Modullevel</td>
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<td>je nach Studiengang Pflicht oder Wahlpflicht</td>
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<td>Time of examination</td>
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<td>Type of examination</td>
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<td>Final exam of module</td>
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### mat980 - Mathematics for the Life Sciences

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<td>Fach-Bachelor Biologie &gt; Naturwissenschaftliche Grundlagen</td>
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**Contact person**

- Module responsibility
  - Peter Harmand
- Authorized examiners
  - Peter Harmand

**Entry requirements**

**Skills to be acquired in this module**

**Module contents**

**Reader's advisory**

**Links**

**Language of instruction** | German |
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**Lern-/Lehrform / Type of program**

**Vorkenntnisse / Previous knowledge**

**Examination**

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**Course type**

<table>
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**Total time of attendance for the module**

56 h
phy910 - Physics for Students of Biology and Dual Subject Chemistry

<table>
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<tr>
<td></td>
<td>Zwei-Fächer-Bachelor Chemie &gt; Aufbaumodule</td>
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Contact person

- Module responsibility
  - Manuela Schiek
  - Gerd Gülker

Authorized examiners

- Alle hier genannten

Entry requirements

Skills to be acquired in this module

Module contents

Reader's advisory

Links

Language of instruction

German

Duration (semesters)

1 Semester

Module frequency

jährlich

Module capacity

unlimited

Modullevel

BM (Basismodul)

Modulart

Ergänzung/Professionalisierung

Lern-/Lehrform / Type of program

Vorkenntnisse / Previous knowledge

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

Seminar

SWS

Frequency

Workload attendance

0 h
bio250 - Biochemistry

Module label       Biochemistry
Module code       bio250
Credit points     6.0 KP
Workload          180 h

Used in course of study
- Fach-Bachelor Biologie > Naturwissenschaftliche Grundlagen
- Zwei-Fächer-Bachelor Biologie > Ergänzungsmodule

Contact person
Module responsibility
- Karl-Wilhelm Koch
Authorized examiners
- Karl-Wilhelm Koch
- Alexander Scholten
Module counseling
- Alexander Scholten

Entry requirements
Skills to be acquired in this module
++ biological knowledge
++ knowledge of biological working methods
+ biologically relevant knowledge in the natural sciences and mathematics
++ abstract, logical, analytical thinking
+ independent learning and (research-based) working
++ data presentation and evidence-based discussion (written and spoken)
++ teamwork
+ (scientific) communication skills
+ project and time management
+ knowledge of safety and environmental issues

The students have a survey of the arrangement, function, and biosynthesis of the most important substance classes and metabolic processes, learn basic experimental methods of biochemistry and are able to present and interpret experimental results.

Module contents
The module gives an introduction to conceptions and methods of biochemistry.

Reader's advisory
General textbooks of Biochemistry, e.g.:
Biochemie, Müller-Esterl
Biochemie, Lubert Stryer
Lehninger Prinzipien der Biochemie, David L. Nelson und Michael M. Cox
Principles of Biochemistry, Horton et al.

Links

Language of instruction    German
Duration (semesters)       1 Semester
Module frequency          jährlich
Module capacity            unlimited
Modullevel                EB (Ergänzungsbereich / Complementary)
Modulart                  Wahlpflicht / Elective

Lern-/Lehrform / Type of program

Vorkenntnisse / Previous knowledge

Examination        Time of examination                     Type of examination
Final exam of module Written examination following the end of lectures or end of the semester. 1 written examination signed minutes

PLEASE NOTE: Additional conditions regarding attendance and ungraded activities as determined by the persons responsible for the module will apply.

Course type     Comment     SWS     Frequency     Workload attendance
Lecture         2.00        28 h
Tutorial        0.00        WiSe  0 h       
Seminar         1.00        14 h        
Practical       2.00        28 h        

81 / 85
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Abschlussmodul

bam - Bachelor’s Thesis Module

Module label | Bachelor’s Thesis Module
---|---
Module code | bam
Credit points | 15.0 KP
Workload | 450 h
Used in course of study | Fach-Bachelor Biologie > Abschlussmodul
Contact person | 
Entry requirements | 
Skills to be acquired in this module | ++ biological knowledge
++ knowledge of biological working methods
+ statistics & scientific programming
+ abstract, logical, analytical thinking
++ deepened expertise in biological specialist field
++ independent learning and (research-based) working
++ data presentation and evidence-based discussion (written and spoken)
+ (scientific) communication skills
++ project and time management

Module contents

Reader’s advisory

Links

Languages of instruction

Duration (semesters) | 1 Semester
Module frequency
Module capacity | unlimited
Modullevel | Abschlussmodul (Abschlussmodul / Conclude)
Modulart | Pflicht / Mandatory

Lern-Lehrform / Type of program

Vorkenntnisse / Previous knowledge

Examination | Time of examination | Type of examination
---|---|---
Final exam of module | Bachelor’s thesis (12 CP) and accompanying seminar (3 CP)
Course type | Seminar

SWS

Frequency

Workload attendance | 0 h
Frühere Module

che100 - Introduction to Chemistry

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<td>Credit points</td>
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<th>Used in course of study</th>
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<tr>
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<tr>
<th>Contact person</th>
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<tr>
<td>Module responsibility</td>
</tr>
<tr>
<td>Thomas Müller</td>
</tr>
<tr>
<td>Rüdiger Beckhaus</td>
</tr>
<tr>
<td>Authorized examiners</td>
</tr>
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<tr>
<td>Module counseling</td>
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<tr>
<td>Lena Albers</td>
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| Entry requirements |

| Skills to be acquired in this module |

| Module contents |

| Reader's advisory |

<table>
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<tr>
<th>Links</th>
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<tbody>
<tr>
<td>Language of instruction</td>
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<tr>
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<td>Module frequency</td>
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<td>Modullevel</td>
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| Lern-/Lehrform / Type of program |

| Vorkenntnisse / Previous knowledge |

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<tr>
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| Total time of attendance for the module | 154 h |

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<td>Workload attendance</td>
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| 56 h |
| 14 h |
| 84 h |
| 0 h |

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