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**Modulhandbuch**  
**Biology - Bachelor's Programme**  
**im Sommersemester 2020**  
erstellt am 19/04/24

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## Basismodule

### bio215 - Introduction to Biology

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|----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|----------------------------------------|-----------------------------------|
| Module label                                                                     | Introduction to Biology                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |     |                                        |                                   |
| Modulkürzel                                                                      | bio215                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |     |                                        |                                   |
| Credit points                                                                    | 9.0 KP                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |     |                                        |                                   |
| Workload                                                                         | 270 h                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |     |                                        |                                   |
| Verwendbarkeit des Moduls                                                        | <ul style="list-style-type: none"><li>• Bachelor's Programme Biology (Bachelor) &gt; Basismodule</li><li>• Bachelor's Programme Mathematics (Bachelor) &gt; Nebenfachmodule</li><li>• Dual-Subject Bachelor's Programme Biology (Bachelor) &gt; Basismodule</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |     |                                        |                                   |
| Zuständige Personen                                                              | <ul style="list-style-type: none"><li>• Gerlach, Gabriele (module responsibility)</li><li>• Zotz, Gerhard (Module counselling)</li><li>• Sienknecht, Ulrike (Module counselling)</li><li>• Gerlach, Gabriele (Prüfungsberechtigt)</li><li>• Zotz, Gerhard (Prüfungsberechtigt)</li><li>• Köppl, Christine (Prüfungsberechtigt)</li><li>• Sienknecht, Ulrike (Prüfungsberechtigt)</li><li>• Käfer, Simon (Prüfungsberechtigt)</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                          |     |                                        |                                   |
| Prerequisites                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |     |                                        |                                   |
| Skills to be acquired in this module                                             | <div>++ biological eknowledge</div> <div>++ biologically relevant knowledge in the natural sciences and mathematics</div> <div>++ interdisciplinary knowledge &amp; thinking</div> <div>++ abstract, logical, analytical thinking</div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |     |                                        |                                   |
|                                                                                  | <div>Qualifications that the module provides</div> <div><ul style="list-style-type: none"><li>• The theoretical basics of the different disciplines of biology are acquired</li><li>• The overview gained enables the students to start their individual study planning, which fits their inclinations and abilities</li><li>• for the professional field of school teachers: consideration of living nature on different system levels (organism, population, ecosystem, biosphere) and with regard to its evolutionary history. Content specifically relevant to this career field are plant morphology and physiology, animal morphology and physiology, neurobiology, behavioural biology, genetics, molecular biology, developmental biology, evolution and biodiversity (systematics), ecology, biogeography, sustainable use of nature, human biology and immunobiology.</li></ul></div> |     |                                        |                                   |
| Module contents                                                                  | Lecture conveys knowledge in - evolution, ecology and biodiversity (WiSe) - animal physiology and developmental biology (SoSe)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |     |                                        |                                   |
| Literatureempfehlungen                                                           | Campbell et al. "Biologie", Pearson Sadava et al. "Purves, Biologie", Springer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |     |                                        |                                   |
| Links                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |     |                                        |                                   |
| Language of instruction                                                          | German                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |     |                                        |                                   |
| Duration (semesters)                                                             | 2 Semester                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |     |                                        |                                   |
| Module frequency                                                                 | jährlich                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |     |                                        |                                   |
| Module capacity                                                                  | 300                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |     |                                        |                                   |
| Examination                                                                      | Prüfungszeiten                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |     | Type of examination                    |                                   |
| Final exam of module                                                             | lecture-free periods after each series                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |     | 2 written examinations (WiSe and SoSe) |                                   |
| Lehrveranstaltungsform                                                           | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | SWS | Frequency                              | Workload of compulsory attendance |
| Lecture                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 12  | SoSe und WiSe                          | 168                               |
| Seminar<br>(Gefahrstoffverordnung und Arbeitsschutz (PFLICHT für Erstsemester!)) |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |     | WiSe                                   | 0                                 |
| Tutorial (optional)                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |     | --                                     | 0                                 |
| Präsenzzeit Modul insgesamt                                                      | 168 h                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |     |                                        |                                   |



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## bio220 - Introductory Zoology-Botany

|                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Module label                         | Introductory Zoology-Botany                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Modulkürzel                          | bio220                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Credit points                        | 9.0 KP                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Workload                             | 270 h                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Verwendbarkeit des Moduls            | <ul style="list-style-type: none"><li>• Bachelor's Programme Biology (Bachelor) &gt; Basismodule</li><li>• Dual-Subject Bachelor's Programme Biology (Bachelor) &gt; Basismodule</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Zuständige Personen                  | <ul style="list-style-type: none"><li>• Ahlrichs, Wilko (module responsibility)</li><li>• Will, Maria (module responsibility)</li><li>• Bininda-Emonds, Olaf (Module counselling)</li><li>• Zotz, Gerhard (Module counselling)</li><li>• Ahlrichs, Wilko (Prüfungsberechtigt)</li><li>• Will, Maria (Prüfungsberechtigt)</li><li>• Zotz, Gerhard (Prüfungsberechtigt)</li><li>• Bininda-Emonds, Olaf (Prüfungsberechtigt)</li><li>• Plewka, Isabelle (Prüfungsberechtigt)</li><li>• Käfer, Simon (Prüfungsberechtigt)</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Prerequisites                        | keine                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Skills to be acquired in this module | <p>++ biological knowledge<br/>+ knowledge of biological working methods<br/>++ biologically relevant knowledge in the natural sciences and mathematics<br/>+ abstract, logical, analytical thinking<br/>+ independent learning and (research-based) working<br/>+ teamwork</p> <p>THEORY:</p> <ul style="list-style-type: none"><li>* To understand the fundamentals of reconstructing phylogenetic relationships</li><li>* To know the phylogenetic system and ground pattern of high-ranking ancestral animal species</li><li>* To know the cell structures, organization, and reproduction of plants and animals</li><li>* To know the morphology and anatomy of individual species</li></ul> <p>PRACTICE:</p> <ul style="list-style-type: none"><li>* To improve and verify the theoretical knowledge acquired from lectures and textbooks by studying the original</li><li>* To train visual and tactile perception by studying various species</li><li>* To learn that representations in textbooks are abstractions of a much more complex reality</li><li>* To be able to criticize representations in textbooks and models</li><li>* To acquire the knowledge of the function in living animals and plants by studying preserved specimens</li><li>* Learning how to follow preparation instructions</li><li>* Learning that the organization of individual species may be highly variable</li><li>* Preparing records or drawings from the information obtained by original specimens studied</li></ul> |
| Module contents                      | <p>GENERAL: Light microscopic methods are applied to study structures in plants and animals. Records in the form of descriptions and drawings.</p> <p>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.</p> <p>ZOOLOGY: Morphological structure of animal tissues. Biology of selected partial taxa and metazoans. Principles of phylogenetic systematics and the phylogenetic position in the animal system of the taxa dealt with.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Literatureempfehlungen               | <p>GENERAL:: Campbell: Biologie (Spektrum Verlag) or Purves: Biologie (Spektrum Verlag), latest edition</p> <p>ZOOLOGY: V. Storch: Kükenenthal Zoologisches Praktikum, one of the latest</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

editions; Optional: Ax, P. (1999-2001): Das System der Metazoa (I,II, III), Fischer Verlag.  
 Westheide/Rieger (1996): Spezielle Zoologie " First part: Einzeller und Wirbellose Tiere, Gustav Fischer Verlag, Stuttgart; Westheide, Wilfried; Rieger, Reinhard Spezielle Zoologie. Second part: Wirbel- oder Schädeltiere 2003, 714 S., 650 s/w Abb. Gebunden ISBN 3-8274-0900-4.

BOTANY: Script; Kück, Wolff Botanisches Grundpraktikum, 2nd edition, Springer, 2008, UTB; Grundlagen der Botanik, UTB; Lüttge, Kluge, Bauer, Botanik, WILEY-VCH, 2010

|                             |         |                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                         |                                   |
|-----------------------------|---------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|
| Links                       |         |                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                         |                                   |
| Language of instruction     |         | German                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                         |                                   |
| Duration (semesters)        |         | 1 Semester                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                         |                                   |
| Module frequency            |         | jährlich                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                         |                                   |
| Module capacity             |         | unlimited                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                         |                                   |
| Reference text              |         | Modul für Studierende <b>mit Studienbeginn vor dem WiSe 23/24.</b><br>(Übergangsbestimmung bis zum Sommersemester 2025; auf Antrag und mit Zustimmung des Prüfungsausschusses ist auch ein Wechsel in die aktuelle Prüfungsordnung möglich). Studierende mit Studienbeginn ab dem WiSe 23/24 studieren die Module bio223 und bio224. |                                                                                                                                                                                                                                                                                                                                         |                                   |
| Examination                 |         | Prüfungszeiten                                                                                                                                                                                                                                                                                                                       | 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<br>1 written examination (50%) following the part Botany;<br><br>voluntary bonus (10%) in the second part (botany)<br><br>PLEASE NOTE:<br>Additional conditions regarding attendance and ungraded activities as determined by the persons responsible for the module will apply. |                                   |
| Lehrveranstaltungsform      | Comment | SWS                                                                                                                                                                                                                                                                                                                                  | Frequency                                                                                                                                                                                                                                                                                                                               | Workload of compulsory attendance |
| Lecture                     |         | 2                                                                                                                                                                                                                                                                                                                                    | WiSe                                                                                                                                                                                                                                                                                                                                    | 28                                |
| Exercises                   |         | 4                                                                                                                                                                                                                                                                                                                                    | WiSe                                                                                                                                                                                                                                                                                                                                    | 56                                |
| Tutorial (optional)         |         |                                                                                                                                                                                                                                                                                                                                      | WiSe                                                                                                                                                                                                                                                                                                                                    | 0                                 |
| Präsenzzeit Modul insgesamt |         |                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                         | 84 h                              |

## bio233 - Basics in Microbiology and Genetics

|                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                          |                  |                                          |
|---------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|------------------------------------------|
| <b>Module label</b>                         | Basics in Microbiology and Genetics                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                          |                  |                                          |
| <b>Modulkürzel</b>                          | bio233                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                          |                  |                                          |
| <b>Credit points</b>                        | 6.0 KP                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                          |                  |                                          |
| <b>Workload</b>                             | 180 h                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                          |                  |                                          |
| <b>Verwendbarkeit des Moduls</b>            | <ul style="list-style-type: none"> <li>• Bachelor's Programme Biology (Bachelor) &gt; Basismodule</li> <li>• Dual-Subject Bachelor's Programme Biology (Bachelor) &gt; Basismodule</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                          |                  |                                          |
| <b>Zuständige Personen</b>                  | <ul style="list-style-type: none"> <li>• Rabus, Ralf Andreas (module responsibility)</li> <li>• Claußen, Maike (Module counselling)</li> <li>• Rabus, Ralf Andreas (Prüfungsberechtigt)</li> <li>• Claußen, Maike (Prüfungsberechtigt)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                          |                  |                                          |
| <b>Prerequisites</b>                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                          |                  |                                          |
| <b>Skills to be acquired in this module</b> | ++ biological knowledge<br>+ knowledge of biological working methods<br>+ biologically relevant knowledge in the natural sciences and mathematics<br>+ deepened expertise in biological specialist field<br>+ independent learning and (research-based) working                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                          |                  |                                          |
| <b>Module contents</b>                      | Grundlagen der Mikrobiologie und Genetik: Mikrobiologie: Moleküle des Lebens; Energie und Enzyme,; Zentralstoffwechsel; Atmung; Photosynthese; anaerober Stoffwechsel; Chemolithotrophie; prokaryotische Zellstruktur; mikrobielle Diversität; Bedeutung von Mikroorganismen für Mensch, Pflanze und Tier, Biotechnologie und Erdsystem. Genetik: Mitose und Zellzyklus, Meiose und Rekombination, Mendelsche Vererbungslehre, chromosomale und molekulare Grundlagen der Vererbung; Replikation, Transkription, Translation, Mutation und DNA-Reparatur, Organisation des genetischen Materials und Genregulation |                                                                                                                                                                          |                  |                                          |
| <b>Literaturempfehlungen</b>                | Purves Biologie (Spektrum Verlag), neuste Ausgabe Campbell et al., Biologie (Pearson Verlag), neuste Ausgabe Fuchs, Allgemeine Mikrobiologie (Thieme Verlag), neueste Auflage                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                          |                  |                                          |
| <b>Links</b>                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                          |                  |                                          |
| <b>Language of instruction</b>              | German                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                          |                  |                                          |
| <b>Duration (semesters)</b>                 | 1 Semester                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                          |                  |                                          |
| <b>Module frequency</b>                     | Sommersemester                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                          |                  |                                          |
| <b>Module capacity</b>                      | unlimited                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                          |                  |                                          |
| <b>Reference text</b>                       | Modul für Studierende <b>mit Studienbeginn vor dem WiSe 23/24.</b><br>(Übergangsbestimmung bis zum Sommersemester 2025; auf Antrag und mit Zustimmung des Prüfungsausschusses ist für Studierende mit einem Studienbeginn vor WiSe 2023/24 auch ein Wechsel in die aktuelle Prüfungsordnung möglich). Studierende mit Studienbeginn ab dem WiSe 23/24 studieren die Module bio225 und bio237.                                                                                                                                                                                                                      |                                                                                                                                                                          |                  |                                          |
| <b>Examination</b>                          | <b>Prüfungszeiten</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <b>Type of examination</b>                                                                                                                                               |                  |                                          |
| <b>Final exam of module</b>                 | Klausuren direkt nach jeweiligem Veranstaltungsteil                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 2 Prüfungsleistungen: <ul style="list-style-type: none"> <li>• 1 Klausur (50 %) nach dem Teil Mikrobiologie</li> <li>• 1 Klausur (50 %) nach dem Teil Genetik</li> </ul> |                  |                                          |
| <b>Lehrveranstaltungsform</b>               | <b>Comment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <b>SWS</b>                                                                                                                                                               | <b>Frequency</b> | <b>Workload of compulsory attendance</b> |
| Lecture                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 4                                                                                                                                                                        | SoSe             | 56                                       |
| Tutorial (optional)                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                          | SoSe             | 0                                        |
| <b>Präsenzzeit Modul insgesamt</b>          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                          |                  | 56 h                                     |

## bio236 - Basics in Biochemistry and Cell Biology

|                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                             |                     |
|--------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|
| Module label                         | Basics in Biochemistry and Cell Biology                                                                                                                                                                                                                                                                                                                                                                                                     |                     |
| Modulkürzel                          | bio236                                                                                                                                                                                                                                                                                                                                                                                                                                      |                     |
| Credit points                        | 6.0 KP                                                                                                                                                                                                                                                                                                                                                                                                                                      |                     |
| Workload                             | 180 h                                                                                                                                                                                                                                                                                                                                                                                                                                       |                     |
| Verwendbarkeit des Moduls            | <ul style="list-style-type: none"> <li>• Bachelor's Programme Biology (Bachelor) &gt; Basismodule</li> <li>• Dual-Subject Bachelor's Programme Biology (Bachelor) &gt; Basismodule</li> </ul>                                                                                                                                                                                                                                               |                     |
| Zuständige Personen                  | <ul style="list-style-type: none"> <li>• Koch, Karl-Wilhelm (module responsibility)</li> <li>• Winkhofer, Michael (Module counselling)</li> <li>• Koch, Karl-Wilhelm (Prüfungsberechtigt)</li> <li>• Winkhofer, Michael (Prüfungsberechtigt)</li> </ul>                                                                                                                                                                                     |                     |
| Prerequisites                        |                                                                                                                                                                                                                                                                                                                                                                                                                                             |                     |
| Skills to be acquired in this module | ++ biological knowledge<br>+ knowledge of biological working methods<br>++ biologically relevant knowledge in the natural sciences and mathematics<br>+ abstract, logical, analytical thinking                                                                                                                                                                                                                                              |                     |
| Module contents                      | 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 |                     |
| Literatureempfehlungen               | Biochemie, Müller-Esterl<br>Stryer Biochemie, Berg, Tymoczko, Stryer<br>Lehninger Prinzipien der Biochemie, David L. Nelson und Michael M. Cox<br>Principles of Biochemistry, Horton et al.<br>Zellbiologie, Helmut Plattner und Joachim Hentschel<br>Molekulare Zellbiologie, Gerald Karp<br>Molekularbiologie der Zelle, Bruce Alberts                                                                                                    |                     |
| Links                                |                                                                                                                                                                                                                                                                                                                                                                                                                                             |                     |
| Language of instruction              | German                                                                                                                                                                                                                                                                                                                                                                                                                                      |                     |
| Duration (semesters)                 | 1 Semester                                                                                                                                                                                                                                                                                                                                                                                                                                  |                     |
| Module frequency                     | Wintersemester                                                                                                                                                                                                                                                                                                                                                                                                                              |                     |
| Module capacity                      | unlimited                                                                                                                                                                                                                                                                                                                                                                                                                                   |                     |
| Reference text                       | Modul für Studierende <b>mit Studienbeginn vor dem WiSe 23/24</b> .<br>(Übergangsbestimmung bis zum Sommersemester 2025; auf Antrag und mit Zustimmung des Prüfungsausschusses ist für Studierende mit einem Studienbeginn vor WiSe 2023/24 auch ein Wechsel in die aktuelle Prüfungsordnung möglich). Studierende mit Studienbeginn ab dem WiSe 23/24 studieren das Modul bio225.                                                          |                     |
| Examination                          | Prüfungszeiten                                                                                                                                                                                                                                                                                                                                                                                                                              | Type of examination |
| Final exam of module                 | during the semester                                                                                                                                                                                                                                                                                                                                                                                                                         | written exam        |
| Lehrveranstaltungsform               | Lecture                                                                                                                                                                                                                                                                                                                                                                                                                                     |                     |
| SWS                                  | 4                                                                                                                                                                                                                                                                                                                                                                                                                                           |                     |
| Frequency                            | WiSe                                                                                                                                                                                                                                                                                                                                                                                                                                        |                     |

# Aufbaumodule

## bio245 - Flora and Fauna

|                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                  |
|--------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Module label                         | Flora and Fauna                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                  |
| Modulkürzel                          | bio245                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                  |
| Credit points                        | 9.0 KP                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                  |
| Workload                             | 270 h                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                  |
| Verwendbarkeit des Moduls            | <ul style="list-style-type: none"> <li>• Bachelor's Programme Biology (Bachelor) &gt; Aufbaumodule</li> <li>• Dual-Subject Bachelor's Programme Biology (Bachelor) &gt; Aufbaumodule</li> <li>• Master of Education Programme (Special Needs Education) Biology (Master of Education) &gt; Mastermodule</li> </ul>                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                  |
| Zuständige Personen                  | <ul style="list-style-type: none"> <li>• Albach, Dirk Carl (module responsibility)</li> <li>• Will, Maria (Module counselling)</li> <li>• Wilke, Tanja (Module counselling)</li> <li>• von Hagen, Klaus Bernhard (Module counselling)</li> <li>• Albach, Dirk Carl (Prüfungsberechtigt)</li> <li>• Will, Maria (Prüfungsberechtigt)</li> <li>• Wilke, Tanja (Prüfungsberechtigt)</li> <li>• Donat, Frank Henrik (Prüfungsberechtigt)</li> <li>• von Hagen, Klaus Bernhard (Prüfungsberechtigt)</li> <li>• Plewka, Isabelle (Prüfungsberechtigt)</li> </ul>                                                                                  |                                                                                                                                                                                                                                                  |
| Prerequisites                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                  |
| 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<br>To determine species-rich taxa and to verify the results independently using relevant literature                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                  |
| Module contents                      | Lecture: 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. Exercise: Applying literature to determine animal and plant species and to classify them systematically. Field Exercise: 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. |                                                                                                                                                                                                                                                  |
| Literatureempfehlungen               | 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)                 | 1 oder 2 Semester                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                  |
| Module frequency                     | jährlich                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                  |
| Module capacity                      | unlimited (<br>Die Übungen zur Fauna können entweder semesterbegleitend im Sommersemester oder im Wintersemester (März/April, als Blockveranstaltung) besucht werden. In beiden Fällen erfolgt die Platzvergabe zu Beginn des Wintersemesters.<br>)                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                  |
| Reference text                       | Modul für<br>- Studierende des <b>Fachbachelors mit Studienbeginn ab dem WiSe 23/24</b> sowie für<br>- <b>Lehramts-Studierende</b> und 2FB-Studierende ohne Lehramtsorientierung <b>mit Studienbeginn vor dem WiSe 23/24</b> . (Übergangsbestimmung bis zum Sommersemester 2025; auf Antrag und mit Zustimmung des Prüfungsausschusses ist auch ein Wechsel in die aktuelle Prüfungsordnung möglich)                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                  |
| Examination                          | Prüfungszeiten                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Type of examination                                                                                                                                                                                                                              |
| Final exam of module                 | Botany: Written examination before the end of the lecture<br>Zoology: Written examination before the end of the lecture                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 1 written examination (Botany 50 %) 1 written examination (Zoology 50 %) ungraded minutes<br>PLEASE NOTE: Additional conditions regarding attendance and ungraded activities as determined by the persons responsible for the module will apply. |

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| Lehrveranstaltungsform                   | Comment | SWS | Frequency     | Workload of compulsory attendance |
|------------------------------------------|---------|-----|---------------|-----------------------------------|
| Lecture                                  |         | 1   | SoSe          | 14                                |
| Vorlesung und Übung (inkl. Geländeübung) |         | 5   | SoSe und WiSe | 70                                |
| <b>Präsenzzeit Modul insgesamt</b>       |         |     |               | <b>84 h</b>                       |

## bio295 - Genetics

|                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |     |                                                             |                                   |
|---------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-------------------------------------------------------------|-----------------------------------|
| <b>Module label</b>                         | Genetics                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |     |                                                             |                                   |
| <b>Modulkürzel</b>                          | bio295                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |     |                                                             |                                   |
| <b>Credit points</b>                        | 9.0 KP                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |     |                                                             |                                   |
| <b>Workload</b>                             | 270 h                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |     |                                                             |                                   |
| <b>Verwendbarkeit des Moduls</b>            | <ul style="list-style-type: none"> <li>• Bachelor's Programme Biology (Bachelor) &gt; Aufbaumodule</li> <li>• Dual-Subject Bachelor's Programme Biology (Bachelor) &gt; Aufbaumodule</li> <li>• Master of Education Programme (Special Needs Education) Biology (Master of Education) &gt; Frühere Module</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                  |     |                                                             |                                   |
| <b>Zuständige Personen</b>                  | <ul style="list-style-type: none"> <li>• Claußen, Maike (module responsibility)</li> <li>• Hartmann, Anna-Maria (Module counselling)</li> <li>• Nothwang, Hans Gerd (Module counselling)</li> <li>• Ebbers, Lena (Module counselling)</li> <li>• Claußen, Maike (Prüfungsberechtigt)</li> <li>• Nothwang, Hans Gerd (Prüfungsberechtigt)</li> <li>• Hartmann, Anna-Maria (Prüfungsberechtigt)</li> <li>• Ebbers, Lena (Prüfungsberechtigt)</li> <li>• Schinzel, Friedrich (Prüfungsberechtigt)</li> </ul>                                                                                                                                                                                                                                                             |     |                                                             |                                   |
| <b>Prerequisites</b>                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |     |                                                             |                                   |
| <b>Skills to be acquired in this module</b> | <p>           ++ biological knowledge<br/>           ++ knowledge of biological working methods<br/>           + biologically relevant knowledge in the natural sciences and mathematics<br/>           + abstract, logical, analytical thinking<br/>           ++ deepened expertise in biological specialist field<br/>           ++ independent learning and (research-based) working<br/>           ++ data presentation and evidence-based discussion (written and spoken)<br/>           + teamwork<br/>           ++ (scientific) communication skills<br/>           + project and time management<br/>           + knowledge of safety and environmental issues         </p> <p>Fundamentals of genetics, performing experiments, quantitative analyses.</p> |     |                                                             |                                   |
| <b>Module contents</b>                      | 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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |     |                                                             |                                   |
| <b>Literatureempfehlungen</b>               | Campbell/Reece Biologie (latest edition, Pearson Verlag), Strachan & Read Molekulare Humangenetik (latest edition, Spektrum Verlag); Purves Biologie (latest edition, Spektrum Verlag).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |     |                                                             |                                   |
| <b>Links</b>                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |     |                                                             |                                   |
| <b>Language of instruction</b>              | German                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |     |                                                             |                                   |
| <b>Duration (semesters)</b>                 | 1 Semester                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |     |                                                             |                                   |
| <b>Module frequency</b>                     | jährlich                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |     |                                                             |                                   |
| <b>Module capacity</b>                      | 72                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |     |                                                             |                                   |
| Examination                                 | Prüfungszeiten                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |     | Type of examination                                         |                                   |
| <b>Final exam of module</b>                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |     | Written examination (100%), ungraded presentation, protocol |                                   |
| Lehrveranstaltungsform                      | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | SWS | Frequency                                                   | Workload of compulsory attendance |
| Lecture                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 1.5 | WiSe                                                        | 21                                |
| Exercises                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 3   | WiSe                                                        | 42                                |
| Seminar                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 1.5 | WiSe                                                        | 21                                |
| <b>Präsenzzeit Modul insgesamt</b>          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |     |                                                             | 84 h                              |

|                                                                                                                                                        |                                                                                                                                                                                                                                                                                   |                     |           |                                   |
|--------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|-----------|-----------------------------------|
| <b>Module label</b>                                                                                                                                    | General Microbiology                                                                                                                                                                                                                                                              |                     |           |                                   |
| <b>Modulkürzel</b>                                                                                                                                     | bio265                                                                                                                                                                                                                                                                            |                     |           |                                   |
| <b>Credit points</b>                                                                                                                                   | 9.0 KP                                                                                                                                                                                                                                                                            |                     |           |                                   |
| <b>Workload</b>                                                                                                                                        | 270 h<br>(<br><br>)                                                                                                                                                                                                                                                               |                     |           |                                   |
| <b>Verwendbarkeit des Moduls</b>                                                                                                                       | <ul style="list-style-type: none"> <li>Bachelor's Programme Biology (Bachelor) &gt; Aufbaumodule</li> <li>Bachelor's Programme Environmental Science (Bachelor) &gt; Wahlpflichtmodule</li> <li>Dual-Subject Bachelor's Programme Biology (Bachelor) &gt; Aufbaumodule</li> </ul> |                     |           |                                   |
| <b>Zuständige Personen</b>                                                                                                                             | <ul style="list-style-type: none"> <li>Rabus, Ralf Andreas (module responsibility)</li> <li>Wöhlbrand, Lars (Module counselling)</li> <li>Rabus, Ralf Andreas (Prüfungsberechtigt)</li> <li>Wöhlbrand, Lars (Prüfungsberechtigt)</li> </ul>                                       |                     |           |                                   |
| <b>Prerequisites</b>                                                                                                                                   |                                                                                                                                                                                                                                                                                   |                     |           |                                   |
| <b>Skills to be acquired in this module</b>                                                                                                            | Basic knowledge of microbiology; ability to assess and apply fundamental microbiological techniques.                                                                                                                                                                              |                     |           |                                   |
| <b>Module contents</b>                                                                                                                                 | 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.             |                     |           |                                   |
| <b>Literatureempfehlungen</b>                                                                                                                          | Allgemeine Mikrobiologie, Schlegel 1992; Brock-Biology of Microorganisms, eds.: Madigan et al., 2003; Grundlagen der Mikrobiologie, Cypionka, 2003                                                                                                                                |                     |           |                                   |
| <b>Links</b>                                                                                                                                           | <a href="http://www-icbm.de/~gmb/11429.html">http://www-icbm.de/~gmb/11429.html</a>                                                                                                                                                                                               |                     |           |                                   |
| <b>Language of instruction</b>                                                                                                                         | German                                                                                                                                                                                                                                                                            |                     |           |                                   |
| <b>Duration (semesters)</b>                                                                                                                            | 1 Semester                                                                                                                                                                                                                                                                        |                     |           |                                   |
| <b>Module frequency</b>                                                                                                                                | jährlich                                                                                                                                                                                                                                                                          |                     |           |                                   |
| <b>Module capacity</b>                                                                                                                                 | unlimited                                                                                                                                                                                                                                                                         |                     |           |                                   |
| Examination                                                                                                                                            | Prüfungszeiten                                                                                                                                                                                                                                                                    | Type of examination |           |                                   |
| <b>Final exam of module</b>                                                                                                                            |                                                                                                                                                                                                                                                                                   |                     |           | 1 written examination             |
| PLEASE NOTE:<br>Additional conditions regarding attendance and ungraded activities as determined by the persons responsible for the module will apply. |                                                                                                                                                                                                                                                                                   |                     |           |                                   |
| Lehrveranstaltungsform                                                                                                                                 | Comment                                                                                                                                                                                                                                                                           | SWS                 | Frequency | Workload of compulsory attendance |
| Lecture                                                                                                                                                |                                                                                                                                                                                                                                                                                   | 2                   | WiSe      | 28                                |
| Seminar                                                                                                                                                |                                                                                                                                                                                                                                                                                   | 1                   | WiSe      | 14                                |
| Practical training                                                                                                                                     |                                                                                                                                                                                                                                                                                   | 4                   | WiSe      | 56                                |
| <b>Präsenzzeit Modul insgesamt</b>                                                                                                                     |                                                                                                                                                                                                                                                                                   |                     |           | 98 h                              |

## bio275 - Basics in Physiology

|                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                  |                                          |
|---------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|------------------------------------------|
| <b>Module label</b>                         | Basics in Physiology                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                  |                                          |
| <b>Modulkürzel</b>                          | bio275                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                  |                                          |
| <b>Credit points</b>                        | 9.0 KP                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                  |                                          |
| <b>Workload</b>                             | 270 h                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                  |                                          |
| <b>Verwendbarkeit des Moduls</b>            | <ul style="list-style-type: none"> <li>• Bachelor's Programme Biology (Bachelor) &gt; Aufbaumodule</li> <li>• Bachelor's Programme Mathematics (Bachelor) &gt; Nebenfachmodule</li> <li>• Dual-Subject Bachelor's Programme Biology (Bachelor) &gt; Aufbaumodule</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                  |                                          |
| <b>Zuständige Personen</b>                  | <ul style="list-style-type: none"> <li>• Heyers, Dominik (module responsibility)</li> <li>• Köppl, Christine (Module counselling)</li> <li>• Dedek, Karin (Module counselling)</li> <li>• Heyers, Dominik (Prüfungsberechtigt)</li> <li>• Köppl, Christine (Prüfungsberechtigt)</li> <li>• Dedek, Karin (Prüfungsberechtigt)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                  |                                          |
| <b>Prerequisites</b>                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                  |                                          |
| <b>Skills to be acquired in this module</b> | <p>           ++ biological knowledge<br/>           ++ knowledge of biological working methods<br/>           + biologically relevant knowledge in the natural sciences and mathematics<br/>           + statistics &amp; scientific programming<br/>           ++ abstract, logical, analytical thinking<br/>           + deepened expertise in biological specialist field<br/>           ++ independent learning and (research-based) working<br/>           + teamwork         </p> <p>           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".         </p> |                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                  |                                          |
| <b>Module contents</b>                      | <p>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.</p>                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                  |                                          |
| <b>Literatureempfehlungen</b>               | <p>           Klinke, Pape, Kurtz, Silbernagl: Physiologie, Aufl. 4, 2014<br/>           Schmidt, Lang, Heckmann: Physiologie des Menschen mit Pathophysiologie, Aufl. 31, 2011<br/>           Wehner, Gehring: Zoologie, Aufl. 25, 2013         </p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                  |                                          |
| <b>Links</b>                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                  |                                          |
| <b>Language of instruction</b>              | German                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                  |                                          |
| <b>Duration (semesters)</b>                 | 1 Semester                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                  |                                          |
| <b>Module frequency</b>                     | jährlich                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                  |                                          |
| <b>Module capacity</b>                      | 144                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                  |                                          |
| <b>Examination</b>                          | <b>Prüfungszeiten</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>Type of examination</b>                                                                                                                                                                                                                                                                                                                                                                                                                                   |                  |                                          |
| <b>Final exam of module</b>                 | within a few weeks after the winter term lecture period                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <p>written exam (100%)</p> <p>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</p> <p>PLEASE NOTE: Additional conditions regarding attendance and ungraded activities as determined by the persons responsible for the module will apply.</p> |                  |                                          |
| <b>Lehrveranstaltungsform</b>               | <b>Comment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <b>SWS</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <b>Frequency</b> | <b>Workload of compulsory attendance</b> |
| Lecture                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 4                                                                                                                                                                                                                                                                                                                                                                                                                                                            | WiSe             | 56                                       |
| Exercises                                   | <b>A C H T U N G</b> Die endgültige Einteilung für die Teilkurse wird über Stud.IP vorgenommen. Bitte achten                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 2                                                                                                                                                                                                                                                                                                                                                                                                                                                            | WiSe             | 28                                       |

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| Lehrveranstaltungsform             | Comment                                                                    | SWS | Frequency | Workload of compulsory attendance |
|------------------------------------|----------------------------------------------------------------------------|-----|-----------|-----------------------------------|
|                                    | <b>Sie zu BEGINN des WiSe auf entsprechende Mitteilungen über Stud.IP.</b> |     |           |                                   |
| <b>Präsenzzeit Modul insgesamt</b> |                                                                            |     |           | <b>84 h</b>                       |

## bio255 - Fundamentals of Molecular Ecology

|                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |     |                     |                                   |
|---------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|---------------------|-----------------------------------|
| <b>Module label</b>                         | Fundamentals of Molecular Ecology                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |     |                     |                                   |
| <b>Modulkürzel</b>                          | bio255                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |     |                     |                                   |
| <b>Credit points</b>                        | 9.0 KP                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |     |                     |                                   |
| <b>Workload</b>                             | 270 h                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |     |                     |                                   |
| <b>Verwendbarkeit des Moduls</b>            | <ul style="list-style-type: none"> <li>• Bachelor's Programme Biology (Bachelor) &gt; Aufbaumodule</li> <li>• Dual-Subject Bachelor's Programme Biology (Bachelor) &gt; Aufbaumodule</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |     |                     |                                   |
| <b>Zuständige Personen</b>                  | <ul style="list-style-type: none"> <li>• Nolte, Arne (module responsibility)</li> <li>• Nolte, Arne (Prüfungsberechtigt)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |     |                     |                                   |
| <b>Prerequisites</b>                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |     |                     |                                   |
| <b>Skills to be acquired in this module</b> | <p>           ++ biological knowledge<br/>           ++ knowledge of biological working methods<br/>           ++ biologically relevant knowledge in the natural sciences and mathematics<br/>           + statistics &amp; scientific programming<br/>           ++ interdisciplinary knowledge &amp; thinking<br/>           ++ abstract, logical, analytical thinking<br/>           ++ deepened expertise in biological specialist field         </p> <p>           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.         </p> |     |                     |                                   |
| <b>Module contents</b>                      | <p>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.</p> <p>Excercise: Modern data sets and up to date methods in genomics and population genetics are introduced. The practical emphasizes computer based data analyses.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |     |                     |                                   |
| <b>Literatureempfehlungen</b>               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |     |                     |                                   |
| <b>Links</b>                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |     |                     |                                   |
| <b>Language of instruction</b>              | German                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |     |                     |                                   |
| <b>Duration (semesters)</b>                 | 1 Semester                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |     |                     |                                   |
| <b>Module frequency</b>                     | jährlich                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |     |                     |                                   |
| <b>Module capacity</b>                      | 30                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |     |                     |                                   |
| Examination                                 | Prüfungszeiten                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |     | Type of examination |                                   |
| <b>Final exam of module</b>                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |     | exam                |                                   |
| Lehrveranstaltungsform                      | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | SWS | Frequency           | Workload of compulsory attendance |
| Lecture                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 1.5 | WiSe                | 21                                |
| Exercises                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 4.5 | WiSe                | 63                                |
| <b>Präsenzzeit Modul insgesamt</b>          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |     |                     | 84 h                              |

## bio256 - Form and Identification - Flora and Fauna

|                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                             |
|--------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|
| Module label                         | Form and Identification - Flora and Fauna                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                             |
| Modulkürzel                          | bio256                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                             |
| Credit points                        | 12.0 KP                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                             |
| Workload                             | 360 h                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                             |
| Verwendbarkeit des Moduls            | <ul style="list-style-type: none"> <li>Bachelor's Programme Biology (Bachelor) &gt; Aufbaumodule</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                             |
| Zuständige Personen                  | <ul style="list-style-type: none"> <li>Albach, Dirk Carl (module responsibility)</li> <li>Will, Maria (Module counselling)</li> <li>Wilke, Tanja (Module counselling)</li> <li>von Hagen, Klaus Bernhard (Module counselling)</li> <li>Donat, Frank Henrik (Module counselling)</li> <li>Albach, Dirk Carl (Prüfungsberechtigt)</li> <li>Will, Maria (Prüfungsberechtigt)</li> <li>Wilke, Tanja (Prüfungsberechtigt)</li> <li>von Hagen, Klaus Bernhard (Prüfungsberechtigt)</li> <li>Donat, Frank Henrik (Prüfungsberechtigt)</li> <li>Plewka, Isabelle (Prüfungsberechtigt)</li> </ul>                                                                                                                                                                                                                                                                                                          |                                             |
| Prerequisites                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                             |
| Skills to be acquired in this module | <p>+ biological knowledge<br/> + knowledge of biological working methods<br/> + independent learning and (research-based) working<br/> + knowledge of safety and environmental issues</p> <p>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 expertises. 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.</p> |                                             |
| Module contents                      | <p>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<br/> EXE: Working with identification keys for plants and animals and their classification<br/> EXC: Excursion to characteristic habitats of Northwestern Germany, practicing work with field guides and identification of important traits</p>                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                             |
| Literaturempfehlungen                | <p>Botany:<br/> Rothmaler - Exkursionsflora von Deutschland, Band 2 - Grundband, Spektrum Akademischer Verlag<br/> Zoology:<br/> M. Schaefer: Brohmer - Fauna von Deutschland, ab 20. Auflage<br/> B. Klausnitzer: Stresemann - Exkursionsfauna von Deutschland. Band 1: Wirbellose (ohne Insekten)</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                             |
| Links                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                             |
| Language of instruction              | German                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                             |
| Duration (semesters)                 | 1 oder 2 Semester                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                             |
| Module frequency                     | jährlich                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                             |
| Module capacity                      | <p>unlimited (</p> <p>Die Übungen zur Fauna können entweder semesterbegleitend im Sommersemester oder im Wintersemester (März/April, als Blockveranstaltung) besucht werden. In beiden Fällen erfolgt die Platzvergabe zu Beginn des Wintersemesters.</p> <p>)</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                             |
| Reference text                       | <p>Modul für Studierende des <b>Fachbachelors mit Studienbeginn vor dem WiSe 23/24</b>. (Übergangsbestimmung bis zum Sommersemester 2025; auf Antrag und mit Zustimmung des Prüfungsausschusses ist auch ein Wechsel in die aktuelle Prüfungsordnung möglich). Studierende des Fachbachelors mit Studienbeginn ab dem WiSe 23/24 studieren das Modul bio245.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                             |
| Examination                          | Prüfungszeiten                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Type of examination                         |
| Final exam of module                 | exams at the end of the semester                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 1 written exam (botany) 50%, 1 written exam |

| Examination                              |         | Prüfungszeiten | Type of examination                                                                                                                                                  |                                   |
|------------------------------------------|---------|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|
|                                          |         |                | (zoology) 50%, excursion protocols (ungraded), additional requirements regarding presence and ungraded activities as specified by docents responsible for the module |                                   |
| Lehrveranstaltungsform                   | Comment | SWS            | Frequency                                                                                                                                                            | Workload of compulsory attendance |
| Lecture                                  |         | 1              | SoSe                                                                                                                                                                 | 14                                |
| Vorlesung und Übung (inkl. Geländeübung) |         | 5              | SoSe                                                                                                                                                                 | 70                                |
| <b>Präsenzzeit Modul insgesamt</b>       |         |                |                                                                                                                                                                      | <b>84 h</b>                       |

# Naturwissenschaftliche Grundlagen

## phy910 - Physics for Students of Biology and Dual Subject Chemistry

|                                             |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |           |                                   |
|---------------------------------------------|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-----------------------------------|
| <b>Module label</b>                         |         | Physics for Students of Biology and Dual Subject Chemistry                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |           |                                   |
| <b>Modulkürzel</b>                          |         | phy910                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |           |                                   |
| <b>Credit points</b>                        |         | 6.0 KP                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |           |                                   |
| <b>Workload</b>                             |         | 180 h                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |           |                                   |
| <b>Verwendbarkeit des Moduls</b>            |         | <ul style="list-style-type: none"> <li>• Bachelor's Programme Biology (Bachelor) &gt; Naturwissenschaftliche Grundlagen</li> <li>• Dual-Subject Bachelor's Programme Biology (Bachelor) &gt; Ergänzungsmodule</li> <li>• Dual-Subject Bachelor's Programme Chemistry (Bachelor) &gt; Aufbaumodule</li> </ul>                                                                                                                                                                                                                                                                                                                                                      |           |                                   |
| <b>Zuständige Personen</b>                  |         | <ul style="list-style-type: none"> <li>• Gütay, Levent (module responsibility)</li> <li>• Petrovic, Vlaho (module responsibility)</li> <li>• Petrovic, Vlaho (Prüfungsberechtigt)</li> <li>• Gütay, Levent (Prüfungsberechtigt)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                        |           |                                   |
| <b>Prerequisites</b>                        |         | Keine                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |           |                                   |
| <b>Skills to be acquired in this module</b> |         | <p>Die Studierenden erlangen die folgenden Fähigkeiten: Theorie: - Verständnis von Naturvorgängen und ihre mathematische Beschreibung - Erhebung und quantitative Analyse von Messdaten - Verständnis der physikalischen Grundlagen von Messapparaturen mit Schwerpunkt auf die in der Biologie häufig verwendeten Messinstrumente. Praxis: Vertiefung und Überprüfung ihrer theoretischen Kenntnisse aus Vorlesungen und Lehrbuch am eigenen Experiment - Teamfähigkeit durch gemeinsames Durchführen der Experimente handwerkliche Fähigkeiten beim Umgang mit Messapparaturen sachkenntliches Arbeiten mit Messanleitungen - Protokollierung einer Messung</p> |           |                                   |
| <b>Module contents</b>                      |         | <p>Vorlesung und Praktikum geben eine Einführung in die Physik, wobei schwerpunktmäßig die grundlegenden Sachverhalte aus Mechanik, Optik, Elektrodynamik, Wärmelehre sowie Atom- und Kernphysik behandelt werden. Zusätzlich werden allgemeine Themen wie Messfehler und Fehlerrechnung behandelt.</p>                                                                                                                                                                                                                                                                                                                                                           |           |                                   |
| <b>Literaturempfehlungen</b>                |         | <p>Giancoli, C.D., „Physik“, Verlag Pearson Studium Tipler, P.A., „Physik“, Spektrum Akademischer, Heidelberg Und ausgewählte Kapitel aus: Halliday, D., Resnick, R., Walker, J.: „Fundamentals of physics“, Wiley VCH Weltner, K., „Mathematik für Physiker 1+2“, Springer Verlag Außerdem speziell für das Praktikum: Anleitungsskript zum Praktikum Geschke, D., „Physikalisches Praktikum“, Teubner Walcher, W., „Praktikum der Physik“, Teubner Westphal W.H. , „Physikalisches Praktikum“, Vieweg</p>                                                                                                                                                       |           |                                   |
| <b>Links</b>                                |         | <a href="http://www.uni-oldenburg.de/physik/praktika/bio-che/bio/">http://www.uni-oldenburg.de/physik/praktika/bio-che/bio/</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |           |                                   |
| <b>Language of instruction</b>              |         | German                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |           |                                   |
| <b>Duration (semesters)</b>                 |         | 1 Semester                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |           |                                   |
| <b>Module frequency</b>                     |         | jährlich                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |           |                                   |
| <b>Module capacity</b>                      |         | unlimited                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |           |                                   |
| Examination                                 |         | Prüfungszeiten                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |           | Type of examination               |
| <b>Final exam of module</b>                 |         | Modulende                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |           | 1 written exam or 1 oral exam     |
| Lehrveranstaltungsform                      | Comment | SWS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Frequency | Workload of compulsory attendance |
| Lecture                                     |         | 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | WiSe      | 2                                 |
| Practical training                          |         | 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | WiSe      | 2                                 |
| <b>Präsenzzeit Modul insgesamt</b>          |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |           | 4 h                               |

## bio150 - Statistics for Biologists

|                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                 |                                          |
|---------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|------------------------------------------|
| <b>Module label</b>                         | Statistics for Biologists                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                 |                                          |
| <b>Modulkürzel</b>                          | bio150                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                 |                                          |
| <b>Credit points</b>                        | 6.0 KP                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                 |                                          |
| <b>Workload</b>                             | 180 h                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                 |                                          |
| <b>Verwendbarkeit des Moduls</b>            | <ul style="list-style-type: none"> <li>Bachelor's Programme Biology (Bachelor) &gt; Naturwissenschaftliche Grundlagen</li> <li>Dual-Subject Bachelor's Programme Biology (Bachelor) &gt; Ergänzungsmodule</li> </ul>                                                                                                                                                                                                                                                                                                                                                             |                                                 |                                          |
| <b>Zuständige Personen</b>                  | <ul style="list-style-type: none"> <li>Kretzberg, Jutta (module responsibility)</li> <li>Kretzberg, Jutta (Prüfungsberechtigt)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                 |                                          |
| <b>Prerequisites</b>                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                 |                                          |
| <b>Skills to be acquired in this module</b> | <p>[nop] + knowledge of biological working methods ++ biologically relevant knowledge in the natural sciences and mathematics ++ statistics &amp; scientific programming + interdisciplinary knowledge &amp; thinking ++ abstract, logical, analytical thinking + independent learning and (research-based) working + data presentation and evidence-based discussion (written and spoken) + teamwork</p> <p>[/nop] Knowledge in applied statistics Basic knowledge of programming language R Ability to plan, conduct and interpret statistical analysis of biological data</p> |                                                 |                                          |
| <b>Module contents</b>                      | Introduction to applied statistics - background and application in R: Logic, set theory, combinatorics, probability theory, distributions, descriptive statistics, inferential statistics, statistical tests, ANOVA, study design, Bayes' statistics, correlation, regression, curve fitting                                                                                                                                                                                                                                                                                     |                                                 |                                          |
| <b>Literatureempfehlungen</b>               | A detailed script for lecture and exercises is available in Stud.IP                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                 |                                          |
| <b>Links</b>                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                 |                                          |
| <b>Language of instruction</b>              | German                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                 |                                          |
| <b>Duration (semesters)</b>                 | 1 Semester                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                 |                                          |
| <b>Module frequency</b>                     | jährlich                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                 |                                          |
| <b>Module capacity</b>                      | unlimited                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                 |                                          |
| <b>Reference text</b>                       | Übungen mit R können auf einem eigenen Laptop oder im Rechnerraum absolviert werden                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                 |                                          |
| <b>Type of module</b>                       | je nach Studiengang Pflicht oder Wahlpflicht                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                 |                                          |
| <b>Module level</b>                         | ---                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                 |                                          |
| <b>Examination</b>                          | <b>Prüfungszeiten</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>Type of examination</b>                      |                                          |
| <b>Final exam of module</b>                 | within two weeks after lecture time                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | written exam (+15% bonus points from exercises) |                                          |
| <b>Lehrveranstaltungsform</b>               | <b>Comment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <b>SWS</b>                                      | <b>Frequency</b>                         |
|                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                 | <b>Workload of compulsory attendance</b> |
| Lecture                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 2                                               | SoSe 28                                  |
| Exercises                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 2                                               | SoSe 28                                  |
| <b>Präsenzzeit Modul insgesamt</b>          | 56 h                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                 |                                          |

## bio251 - Exercises in Biochemistry and Molecular Biology

|                                             |                                                                                                                                                                                                                                                                                                                                          |     |                                               |                                   |
|---------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----------------------------------------------|-----------------------------------|
| <b>Module label</b>                         | Exercises in Biochemistry and Molecular Biology                                                                                                                                                                                                                                                                                          |     |                                               |                                   |
| <b>Modulkürzel</b>                          | bio251                                                                                                                                                                                                                                                                                                                                   |     |                                               |                                   |
| <b>Credit points</b>                        | 6.0 KP                                                                                                                                                                                                                                                                                                                                   |     |                                               |                                   |
| <b>Workload</b>                             | 180 h                                                                                                                                                                                                                                                                                                                                    |     |                                               |                                   |
| <b>Verwendbarkeit des Moduls</b>            | <ul style="list-style-type: none"> <li>• Bachelor's Programme Biology (Bachelor) &gt; Naturwissenschaftliche Grundlagen</li> <li>• Dual-Subject Bachelor's Programme Biology (Bachelor) &gt; Ergänzungsmodule</li> </ul>                                                                                                                 |     |                                               |                                   |
| <b>Zuständige Personen</b>                  | <ul style="list-style-type: none"> <li>• Scholten, Alexander (module responsibility)</li> <li>• Nolte, Arne (Module counselling)</li> <li>• Scholten, Alexander (Prüfungsberechtigt)</li> <li>• Nolte, Arne (Prüfungsberechtigt)</li> </ul>                                                                                              |     |                                               |                                   |
| <b>Prerequisites</b>                        | admission of BSc students in Biology                                                                                                                                                                                                                                                                                                     |     |                                               |                                   |
| <b>Skills to be acquired in this module</b> | ++ biological knowledge<br>++ knowledge of biological working methods<br>+ biologically relevant knowledge in the natural sciences and mathematics<br>+ abstract, logical, analytical thinking<br>+ data presentation and evidence-based discussion (written and spoken)<br>+ teamwork<br>+ knowledge of safety and environmental issues |     |                                               |                                   |
| <b>Module contents</b>                      | General introduction to principles of laboratory work in Biochemistry and Cell Biology                                                                                                                                                                                                                                                   |     |                                               |                                   |
| <b>Literatureempfehlungen</b>               | Script                                                                                                                                                                                                                                                                                                                                   |     |                                               |                                   |
| <b>Links</b>                                |                                                                                                                                                                                                                                                                                                                                          |     |                                               |                                   |
| <b>Language of instruction</b>              | German                                                                                                                                                                                                                                                                                                                                   |     |                                               |                                   |
| <b>Duration (semesters)</b>                 | 1 Semester                                                                                                                                                                                                                                                                                                                               |     |                                               |                                   |
| <b>Module frequency</b>                     |                                                                                                                                                                                                                                                                                                                                          |     |                                               |                                   |
| <b>Module capacity</b>                      | unlimited                                                                                                                                                                                                                                                                                                                                |     |                                               |                                   |
| Examination                                 | Prüfungszeiten                                                                                                                                                                                                                                                                                                                           |     | Type of examination                           |                                   |
| <b>Final exam of module</b>                 | during semester                                                                                                                                                                                                                                                                                                                          |     | written exam; additionally ungraded protocols |                                   |
| Lehrveranstaltungsform                      | Comment                                                                                                                                                                                                                                                                                                                                  | SWS | Frequency                                     | Workload of compulsory attendance |
| Seminar                                     |                                                                                                                                                                                                                                                                                                                                          | 1   | SoSe                                          | 14                                |
| Exercises                                   |                                                                                                                                                                                                                                                                                                                                          | 3   | SoSe                                          | 42                                |
| <b>Präsenzzeit Modul insgesamt</b>          |                                                                                                                                                                                                                                                                                                                                          |     |                                               | 56 h                              |

## che101 - Basic Chemistry

|                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                     |                                   |
|---------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|-----------------------------------|
| <b>Module label</b>                         | Basic Chemistry                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                     |                                   |
| <b>Modulkürzel</b>                          | che101                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                     |                                   |
| <b>Credit points</b>                        | 6.0 KP                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                     |                                   |
| <b>Workload</b>                             | 180 h                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                     |                                   |
| <b>Verwendbarkeit des Moduls</b>            | <ul style="list-style-type: none"> <li>• Bachelor's Programme Biology (Bachelor) &gt; Naturwissenschaftliche Grundlagen</li> <li>• Bachelor's Programme Mathematics (Bachelor) &gt; Nebenfachmodule</li> <li>• Dual-Subject Bachelor's Programme Biology (Bachelor) &gt; Ergänzungsmodule</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                          |                     |                                   |
| <b>Zuständige Personen</b>                  | <ul style="list-style-type: none"> <li>• Wark, Michael (module responsibility)</li> <li>• Wark, Michael (Prüfungsberechtigt)</li> <li>• Bottke, Patrick (Prüfungsberechtigt)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                     |                                   |
| <b>Prerequisites</b>                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                     |                                   |
| <b>Skills to be acquired in this module</b> | <p>Students have basic knowledge of the structure of atoms and molecules. They know the periodic table of chemical elements, the properties of important elements and their most important compounds and reactions. They are familiar with equilibria in aqueous solutions. They will be able to use equilibrium settings to solve small analytical tasks and describe these equilibria using formulas. They will be familiar with acids and bases as well as reduction and oxidation reactions. Students are familiar with selected methods for quantifying chemical compounds using spectroscopy. Students know the most important organic molecules and classes of natural substances.</p> |                     |                                   |
| <b>Module contents</b>                      | <p>Lecture: General and inorganic chemistry (3 SWS)</p> <p>Structure of the periodic table; basics of chemical bonding; nomenclature of chemical compounds; stoichiometric laws; chemical equilibria; fundamental material chemistry; structure of important compounds; acids and bases; reductions and oxidations; introduction to methods of spectroscopy and chromatography.</p> <p>Exercise: Exercise for the lecture General and Inorganic Chemistry (1 SWS)</p>                                                                                                                                                                                                                         |                     |                                   |
| <b>Literatureempfehlungen</b>               | <p>Zeeck: Chemie für Mediziner, Urban &amp; Schwarzenberg;</p> <p>Latscha/Katzmaier: Chemie für Biologen, Springer;</p> <p>Riedel: Anorganische Chemie, de Gruyter;</p> <p>Holleman-Wiberg: Lehrbuch der Anorganischen Chemie, de Gruyter;</p> <p>Skript zur Vorlesung</p>                                                                                                                                                                                                                                                                                                                                                                                                                    |                     |                                   |
| <b>Links</b>                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                     |                                   |
| <b>Language of instruction</b>              | German                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                     |                                   |
| <b>Duration (semesters)</b>                 | 1 Semester                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                     |                                   |
| <b>Module frequency</b>                     | jährlich                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                     |                                   |
| <b>Module capacity</b>                      | unlimited                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                     |                                   |
| <b>Reference text</b>                       | 6 KP / WiSe: V 101, Ü 101Ü                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                     |                                   |
| Examination                                 | Prüfungszeiten                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Type of examination |                                   |
| <b>Final exam of module</b>                 | Klausur am Beginn der vorlesungsfreien Zeit (normalerweise Anfang Februar)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | written exam (100%) |                                   |
| Lehrveranstaltungsform                      | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | SWS                 | Frequency                         |
|                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                     | Workload of compulsory attendance |
| Lecture                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 3                   | WiSe 42                           |
| Exercises                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 1                   | WiSe 14                           |
| <b>Präsenzzeit Modul insgesamt</b>          | 56 h                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                     |                                   |

## che102 - Basic Chemistry Laboratory

|                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |     |                     |                                   |
|--------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|---------------------|-----------------------------------|
| Module label                         | Basic Chemistry Laboratory                                                                                                                                                                                                                                                                                                                                                                                                                                                  |     |                     |                                   |
| Modulkürzel                          | che102                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |     |                     |                                   |
| Credit points                        | 6.0 KP                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |     |                     |                                   |
| Workload                             | 180 h                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |     |                     |                                   |
| Verwendbarkeit des Moduls            | <ul style="list-style-type: none"><li>• Bachelor's Programme Biology (Bachelor) &gt; Naturwissenschaftliche Grundlagen</li><li>• Bachelor's Programme Mathematics (Bachelor) &gt; Nebenfachmodule</li><li>• Dual-Subject Bachelor's Programme Biology (Bachelor) &gt; Ergänzungsmodule</li></ul>                                                                                                                                                                            |     |                     |                                   |
| Zuständige Personen                  | <ul style="list-style-type: none"><li>• Koch, Rainer (module responsibility)</li><li>• Koch, Rainer (Prüfungsberechtigt)</li></ul>                                                                                                                                                                                                                                                                                                                                          |     |                     |                                   |
| Prerequisites                        | bestandene Modulprüfung che101 (Nachweis chemischer Grundkenntnisse für Laborsicherheit)                                                                                                                                                                                                                                                                                                                                                                                    |     |                     |                                   |
| Skills to be acquired in this module | Die Studierenden beherrschen die praktischen Grundlagen der allgemeinen und anorganischen Chemie. Sie lernen die Arbeit im chemischen Labor anhand von Standardprozeduren kennen und machen sich mit den Grundregeln der chemischen Laborpraxis vertraut. Sie können die Durchführung und die Beobachtung chemischer Experimente nach den Regeln guter wissenschaftlicher Praxis dokumentieren und die Ergebnisse von Versuchen aussagekräftig und fundiert protokollieren. |     |                     |                                   |
| Module contents                      | VL: Theoretische Grundlagen der im Praktikum durchgeführten Versuche<br>PR: Einführung in die Laborpraxis: Erlernen wichtiger Standardprozeduren im chemischen Labor.                                                                                                                                                                                                                                                                                                       |     |                     |                                   |
| Literaturempfehlungen                | Lehrbücher der allgemeinen und anorganischen Chemie, z.B. Riedel, Anorganische Chemie, de Gruyter; Holleman-Wiberg, Lehrbuch der Anorganischen Chemie, de Gruyter;<br>Zeeck: Chemie für Mediziner, Urban & Schwarzenberg;<br>Latsche/Katzmaier: Chemie für Biologen, Springer;<br>Praktikumsskript.                                                                                                                                                                         |     |                     |                                   |
| Links                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |     |                     |                                   |
| Language of instruction              | German                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |     |                     |                                   |
| Duration (semesters)                 | 1 Semester                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |     |                     |                                   |
| Module frequency                     | jährlich                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |     |                     |                                   |
| Module capacity                      | unlimited (<br>Die maximale Teilnehmerzahl ist beim Modulverantwortlichen zu erfragen.<br>)                                                                                                                                                                                                                                                                                                                                                                                 |     |                     |                                   |
| Reference text                       | VL 5.07.714, PR 5.07.713                                                                                                                                                                                                                                                                                                                                                                                                                                                    |     |                     |                                   |
| Examination                          | Prüfungszeiten                                                                                                                                                                                                                                                                                                                                                                                                                                                              |     | Type of examination |                                   |
| Final exam of module                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |     | not graded          |                                   |
| Lehrveranstaltungsform               | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | SWS | Frequency           | Workload of compulsory attendance |
| Lecture                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 1   | WiSe                | 14                                |
| Practical training                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 5   | WiSe                | 70                                |
| Präsenzzeit Modul insgesamt          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |     |                     | 84 h                              |

## mat980 - Mathematics for the Life Sciences

|                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |     |                     |                                   |      |
|---------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|---------------------|-----------------------------------|------|
| <b>Module label</b>                         | Mathematics for the Life Sciences                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |     |                     |                                   |      |
| <b>Modulkürzel</b>                          | mat980                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |     |                     |                                   |      |
| <b>Credit points</b>                        | 6.0 KP                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |     |                     |                                   |      |
| <b>Workload</b>                             | 180 h                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |     |                     |                                   |      |
| <b>Verwendbarkeit des Moduls</b>            | <ul style="list-style-type: none"> <li>• Bachelor's Programme Biology (Bachelor) &gt; Naturwissenschaftliche Grundlagen</li> <li>• Dual-Subject Bachelor's Programme Biology (Bachelor) &gt; Ergänzungsmodule</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |     |                     |                                   |      |
| <b>Zuständige Personen</b>                  | <ul style="list-style-type: none"> <li>• Vertman, Boris (module responsibility)</li> <li>• Werner, Tino (Module counselling)</li> <li>• Schöpfer, Frank (Module counselling)</li> <li>• Shestakov, Ivan (Module counselling)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |     |                     |                                   |      |
| <b>Prerequisites</b>                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |     |                     |                                   |      |
| <b>Skills to be acquired in this module</b> | <p>Aufbauend auf einem mittleren Abiturwissen werden Teile des Schulstoffs wiederholt (Ableitung und Integral), ergänzt (allgemeiner Abbildungsbegriff, Folgen und Reihen) und weiterentwickelt (Taylorreihe, Differentialgleichungen). Die Mathematik wird dabei im wesentlichen ohne Beweise als Handwerkszeug präsentiert. Die Ideen hinter den Begriffen und die Bedeutung der Ergebnisse werden jedoch ausführlich erklärt. Die Studierenden sollen - ihr Schulwissen wiederholen und festigen, - die Anwendung von Mathematik in der Biologie mit zahlreichen praktischen Übungsaufgaben lernen, - ihr allgemeines Wissen mathematischer Methoden und Modelle verbreitern und üben, - die grundlegenden Formen von diskreten und kontinuierlichen, ungebremsten und gebremsten Wachstumsprozessen kennenlernen, - erfahren, wie analytisches und abstraktes Denken bei dem Studium realer Probleme helfen kann.</p> |     |                     |                                   |      |
| <b>Module contents</b>                      | <p>Folgen und Konvergenz: Abbildungen und Funktionen, rekursiv definierte Folgen und diskrete Wachstumsmodelle, Konvergenz, Reihen. Reelle Funktionen: Grenzwert und Stetigkeit, Exponential- und trigonometrische Funktionen, Koordinatentransformationen. Differential- und Integralrechnung: Ableitung und Integral, Mittelwertsatz, Taylorentwicklung, Newton-Verfahren, Hauptsatz, uneigentliche Integrale. Differentialgleichungen: Einfache Differentialgleichungen 1. Ordnung (linear homogen, logistisch), Richtungsfeld, stationäre Zustände und Stabilität, Anwendungen. Differentialgleichungen höherer Ordnung und Systeme (Schwingungsgleichung, Lotka-Volterra-Modell).</p>                                                                                                                                                                                                                                |     |                     |                                   |      |
| <b>Literaturempfehlungen</b>                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |     |                     |                                   |      |
| <b>Links</b>                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |     |                     |                                   |      |
| <b>Language of instruction</b>              | German                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |     |                     |                                   |      |
| <b>Duration (semesters)</b>                 | 1 Semester                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |     |                     |                                   |      |
| <b>Module frequency</b>                     | jährlich                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |     |                     |                                   |      |
| <b>Module capacity</b>                      | unlimited                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |     |                     |                                   |      |
| <b>Reference text</b>                       | 6 KP   1 V: 981, 1 Ü: 982  1. FS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |     |                     |                                   |      |
| Examination                                 | Prüfungszeiten                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |     | Type of examination |                                   |      |
| <b>Final exam of module</b>                 | Vorlesungsende                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |     | KL                  |                                   |      |
| Lehrveranstaltungsform                      | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | SWS | Frequency           | Workload of compulsory attendance |      |
| Lecture                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 3   |                     | 42                                |      |
| Exercises                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 1   |                     | 14                                |      |
| <b>Präsenzzeit Modul insgesamt</b>          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |     |                     |                                   | 56 h |

## che190 - Basic Organic Chemistry

|                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|--------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Module label                         | Basic Organic Chemistry                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Modulkürzel                          | che190                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Credit points                        | 6.0 KP                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Workload                             | 180 h                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Verwendbarkeit des Moduls            | <ul style="list-style-type: none"><li>• Bachelor's Programme Biology (Bachelor) &gt; Naturwissenschaftliche Grundlagen</li><li>• Bachelor's Programme Chemistry (Bachelor) &gt; Aufbaumodule</li><li>• Dual-Subject Bachelor's Programme Biology (Bachelor) &gt; Ergänzungsmodule</li><li>• Dual-Subject Bachelor's Programme Chemistry (Bachelor) &gt; Aufbaumodule</li><li>• Dual-Subject Bachelor's Programme Chemistry (Bachelor) &gt; Erweiterungsmodule</li><li>• Master of Education Programme (Special Needs Education) Chemistry (Master of Education) &gt; Mastermodule</li><li>• Master of Education Programme (Vocational and Business Education) Chemistry (Master of Education) &gt; Mastermodule</li></ul> |
| Zuständige Personen                  | <ul style="list-style-type: none"><li>• Christoffers, Jens (module responsibility)</li><li>• Christoffers, Jens (Prüfungsberechtigt)</li><li>• Hilt, Gerhard (Prüfungsberechtigt)</li><li>• Doye, Sven (Prüfungsberechtigt)</li><li>• Hilt, Gerhard (Module counselling)</li><li>• Doye, Sven (Module counselling)</li><li>• Christoffers, Jens (Module counselling)</li></ul>                                                                                                                                                                                                                                                                                                                                            |
| Prerequisites                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Skills to be acquired in this module |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

### **Kenntnisse**

Grundlegende Stoffsystematik der Organischen Chemie, Reaktionsweisen organischer Verbindungen, grundlegende Reaktionsmechanismen

### **Fertigkeiten**

Beherrschung der Grundlagen der Organischen Chemie: Stoffklassen, funktionelle Gruppen, Nomenklatur; Formulieren organisch-chemischer Reaktionsgleichungen, Transformationen funktioneller Gruppen, Aufbau von Kohlenstoff-Kohlenstoff-Bindungen; Benennung der Konfiguration chiraler Verbindungen

### Module contents

- Mit dem Besuch dieses Moduls erwerben die Studierenden das Basiswissen der Organischen Chemie.
- Hierzu zählen insbesondere Kenntnisse über die Stoffsystematik, die Nomenklatur, eine Übersicht über funktionelle Gruppen, deren Herstellung und wichtigste Eigenschaften, die Stereochemie, die Reaktivität organischer Verbindungen, grundlegende Reaktionsmechanismen, wichtige synthetische Makromoleküle und die bedeutendsten Naturstoffklassen.

### Literaturempfehlungen

- Wird in der Vorlesung bekannt gegeben

### Links

|                         |                                             |
|-------------------------|---------------------------------------------|
| Language of instruction | German                                      |
| Duration (semesters)    | 1 Semester                                  |
| Module frequency        | jährlich                                    |
| Module capacity         | unlimited                                   |
| Reference text          | Empfohlene Belegung: 3. Fachsemester (WiSe) |

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| Examination                   | Prüfungszeiten                                                                                                    | Type of examination |
|-------------------------------|-------------------------------------------------------------------------------------------------------------------|---------------------|
| <b>Final exam of module</b>   | <ul style="list-style-type: none"><li>• In der vorlesungsfreien Zeit entsprechend separater Ankündigung</li></ul> | written exam        |
| <b>Lehrveranstaltungsform</b> | Lecture                                                                                                           |                     |
| <b>SWS</b>                    | 4                                                                                                                 |                     |
| <b>Frequency</b>              | WiSe                                                                                                              |                     |

## che290 - Experimental Organic Chemistry

|                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |     |                     |                                   |
|---------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|---------------------|-----------------------------------|
| <b>Module label</b>                         | Experimental Organic Chemistry                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |     |                     |                                   |
| <b>Modulkürzel</b>                          | che290                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |     |                     |                                   |
| <b>Credit points</b>                        | 6.0 KP                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |     |                     |                                   |
| <b>Workload</b>                             | 180 h                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |     |                     |                                   |
| <b>Verwendbarkeit des Moduls</b>            | <ul style="list-style-type: none"> <li>• Bachelor's Programme Biology (Bachelor) &gt; Naturwissenschaftliche Grundlagen</li> <li>• Dual-Subject Bachelor's Programme Biology (Bachelor) &gt; Ergänzungsmodule</li> <li>• Dual-Subject Bachelor's Programme Chemistry (Bachelor) &gt; Aufbaumodule</li> <li>• Master of Education Programme (Vocational and Business Education) Chemistry (Master of Education) &gt; Mastermodule</li> </ul>                                                                                                        |     |                     |                                   |
| <b>Zuständige Personen</b>                  | <ul style="list-style-type: none"> <li>• Doye, Sven (module responsibility)</li> <li>• Christoffers, Jens (Prüfungsberechtigt)</li> <li>• Doye, Sven (Prüfungsberechtigt)</li> <li>• Martens, Jürgen (Prüfungsberechtigt)</li> <li>• Hilt, Gerhard (Prüfungsberechtigt)</li> <li>• Christoffers, Jens (Module counselling)</li> <li>• Doye, Sven (Module counselling)</li> <li>• Hilt, Gerhard (Module counselling)</li> </ul>                                                                                                                     |     |                     |                                   |
| <b>Prerequisites</b>                        | Erfolgreiche Teilnahme am Modul "che190 - Grundvorlesung Organische Chemie"                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |     |                     |                                   |
| <b>Skills to be acquired in this module</b> | Den Studierenden soll der Ausbau ihrer grundlegenden Kenntnisse über die Reaktivität organisch-chemischer Substanzen in Theorie und Praxis ermöglicht werden. Hierfür werden die Studierenden in die Lage versetzt, unter sicherheits- und umweltrelevanten Gesichtspunkten fach- und ordnungsgemäß mit einfachen Chemikalien umzugehen und selbständig organisch-chemische Experimente durchzuführen. Sie erlangen darüber hinaus grundlegende Fähigkeiten zur Präsentation wissenschaftlicher Sachverhalte in schriftlicher und mündlicher Form. |     |                     |                                   |
| <b>Module contents</b>                      | Mit diesem Modul bauen die Studierenden ihr Basiswissen der Organischen Chemie weiter aus und wenden es im Rahmen dieses Praktikums im Labor an. Sie erlernen dabei grundlegende Arbeitstechniken aus dem Bereich der präparativen Organischen Chemie, indem sie ausgewählte organische Reaktionen und Analysemethoden (z.B. Substitution, Eliminierung, Polymerisation, Veresterung, Verseifung, Oxidation, Reduktion, Aldolkondensation, Extraktion, Dünnschichtchromatographie) eigenhändig durchführen.                                        |     |                     |                                   |
| <b>Literatureempfehlungen</b>               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |     |                     |                                   |
| <b>Links</b>                                | <a href="https://uol.de/oc-doye/lehre">https://uol.de/oc-doye/lehre</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |     |                     |                                   |
| <b>Language of instruction</b>              | German                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |     |                     |                                   |
| <b>Duration (semesters)</b>                 | 1 Semester                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |     |                     |                                   |
| <b>Module frequency</b>                     | jährlich                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |     |                     |                                   |
| <b>Module capacity</b>                      | 70                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |     |                     |                                   |
| <b>Reference text</b>                       | SoSe: PR 204, S 205 / 4. FS / Doye                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |     |                     |                                   |
| Examination                                 | Prüfungszeiten                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |     | Type of examination |                                   |
| <b>Final exam of module</b>                 | Konsultationen zu den Experimenten und Anfertigung von Versuchsprotokollen begleitend zum Praktikum, ein Vortrag im Anschluss an das Praktikum (Termine laut Aushang), eine mündliche Prüfung von maximal 45 Minuten Dauer nach erfolgreichem Abschluss der anderen zu erbringenden Leistungen und Terminvereinbarung mit einem der möglichen Prüfer spätestens zum Ende des Semesters                                                                                                                                                             |     | KL                  |                                   |
| Lehrveranstaltungsform                      | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | SWS | Frequency           | Workload of compulsory attendance |
| Seminar                                     | Blockveranstaltung                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 3   | SoSe                | 42                                |
| Practical training                          | Blockveranstaltung                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 3   | SoSe                | 42                                |
| <b>Präsenzzeit Modul insgesamt</b>          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |     |                     | 84 h                              |

# Akzentsetzungsmodule

## bio300 - Evolutionary Biology

|                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |            |                                                                                                                                                                                                            |                                          |
|---------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|
| <b>Module label</b>                         | Evolutionary Biology                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |            |                                                                                                                                                                                                            |                                          |
| <b>Modulkürzel</b>                          | bio300                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |            |                                                                                                                                                                                                            |                                          |
| <b>Credit points</b>                        | 15.0 KP                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |            |                                                                                                                                                                                                            |                                          |
| <b>Workload</b>                             | 450 h                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |            |                                                                                                                                                                                                            |                                          |
| <b>Verwendbarkeit des Moduls</b>            | <ul style="list-style-type: none"> <li>• Bachelor's Programme Biology (Bachelor) &gt; Akzentsetzungsmodule</li> <li>• Dual-Subject Bachelor's Programme Biology (Bachelor) &gt; Akzentsetzungsmodule</li> <li>• Master of Education Programme (Gymnasium) Biology (Master of Education) &gt; Mastermodule</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |            |                                                                                                                                                                                                            |                                          |
| <b>Zuständige Personen</b>                  | <ul style="list-style-type: none"> <li>• Bininda-Emonds, Olaf (module responsibility)</li> <li>• Bininda-Emonds, Olaf (Prüfungsberechtigt)</li> <li>• Ahlrichs, Wilko (Prüfungsberechtigt)</li> <li>• Albach, Dirk Carl (Prüfungsberechtigt)</li> <li>• Gerlach, Gabriele (Prüfungsberechtigt)</li> <li>• Nolte, Arne (Prüfungsberechtigt)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |            |                                                                                                                                                                                                            |                                          |
| <b>Prerequisites</b>                        | Abschluss der Basismodule                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |            |                                                                                                                                                                                                            |                                          |
| <b>Skills to be acquired in this module</b> | <p>           ++ biological knowledge<br/>           + knowledge of biological working methods<br/>           ++ biologically relevant knowledge in the natural sciences and mathematics<br/>           + statistics &amp; scientific programming<br/>           + interdisciplinary knowledge &amp; thinking<br/>           + abstract, logical, analytical thinking<br/>           ++ deepened expertise in biological specialist field<br/>           + independent learning and (research-based) working<br/>           ++ data presentation and evidence-based discussion (written and spoken)<br/>           + teamwork<br/>           ++ (scientific) communication skills<br/>           + project and time management         </p> <p>           Introduction to both microevolution (speciation and species concepts, adaptation and selection, behavioural ecology, reproduction systems) and macroevolution.<br/>           Introduction to phylogenetics (phyloinformatics, molecular systematics, phylogeography).         </p> |            |                                                                                                                                                                                                            |                                          |
| <b>Module contents</b>                      | <p>The lecture imparts basic knowledge in areas including population biology, phylogenetic systematics, phyloinformatics, behavioural and reproduction ecology. These fundamentals are extended in the seminar and exercises.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |            |                                                                                                                                                                                                            |                                          |
| <b>Literatureempfehlungen</b>               | <p>Freeman, S. and C.J. Herron. 2007. Evolutionary analysis. 4th edition. 800 pp.; Futuyma, D.J. 2007. Evolution. The original with translation. Spektrum Akademischer Verlag. 607 pp.; Knoop, V. and K. Müller. 2009. Gene und Stammbäume: ein Handbuch zur molekularen Phylogenetik. 2. Auflage. Spektrum Akademischer Verlag. 386 pp.; Zrzavy, J., D. Storch, and S. Mihulka. 2009. Evolution: ein Lese-Lehrbuch. Spektrum Akademischer Verlag. 493 pp</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |            |                                                                                                                                                                                                            |                                          |
| <b>Links</b>                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |            |                                                                                                                                                                                                            |                                          |
| <b>Language of instruction</b>              | German                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |            |                                                                                                                                                                                                            |                                          |
| <b>Duration (semesters)</b>                 | 1 Semester                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |            |                                                                                                                                                                                                            |                                          |
| <b>Module frequency</b>                     | jährlich                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |            |                                                                                                                                                                                                            |                                          |
| <b>Module capacity</b>                      | unlimited                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |            |                                                                                                                                                                                                            |                                          |
| <b>Examination</b>                          | <b>Prüfungszeiten</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |            | <b>Type of examination</b>                                                                                                                                                                                 |                                          |
| <b>Final exam of module</b>                 | Written examination in the final week of the semester or in the first week following the lecture period.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |            | Written examination (60%)<br>Portfolio (40%)<br><br>PLEASE NOTE:<br>Additional conditions regarding attendance and ungraded activities as determined by the persons responsible for the module will apply. |                                          |
| <b>Lehrveranstaltungsform</b>               | <b>Comment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <b>SWS</b> | <b>Frequency</b>                                                                                                                                                                                           | <b>Workload of compulsory attendance</b> |
| Lecture                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 2          | WiSe                                                                                                                                                                                                       | 28                                       |

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| Lehrveranstaltungsform             | Comment | SWS | Frequency | Workload of compulsory attendance |
|------------------------------------|---------|-----|-----------|-----------------------------------|
| Exercises                          |         | 6   | WiSe      | 84                                |
| Seminar                            |         | 2   | WiSe      | 28                                |
| <b>Präsenzzeit Modul insgesamt</b> |         |     |           | 140 h                             |

## bio310 - General Ecology

|                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Module label                         | General Ecology                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Modulkürzel                          | bio310                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Credit points                        | 15.0 KP                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Workload                             | 450 h                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Verwendbarkeit des Moduls            | <ul style="list-style-type: none"> <li>• Bachelor's Programme Biology (Bachelor) &gt; Akzentsetzungsmodule</li> <li>• Dual-Subject Bachelor's Programme Biology (Bachelor) &gt; Akzentsetzungsmodule</li> <li>• Master of Education Programme (Gymnasium) Biology (Master of Education) &gt; Mastermodule</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Zuständige Personen                  | <ul style="list-style-type: none"> <li>• Hillebrand, Helmut (module responsibility)</li> <li>• Zotz, Gerhard (Module counselling)</li> <li>• Schupp, Peter (Module counselling)</li> <li>• Striebel, Maren (Module counselling)</li> <li>• Rohde, Sven (Module counselling)</li> <li>• Hillebrand, Helmut (Prüfungsberechtigt)</li> <li>• Zotz, Gerhard (Prüfungsberechtigt)</li> <li>• Schupp, Peter (Prüfungsberechtigt)</li> <li>• Striebel, Maren (Prüfungsberechtigt)</li> <li>• Rohde, Sven (Prüfungsberechtigt)</li> <li>• Fernandez-Mendez, Mar (Prüfungsberechtigt)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Prerequisites                        | Abschluss der Basismodule                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Skills to be acquired in this module | <p>++ biological knowledge<br/> ++ knowledge of biological working methods<br/> ++ biologically relevant knowledge in the natural sciences and mathematics<br/> + statistics &amp; scientific programming<br/> + interdisciplinary knowledge &amp; thinking<br/> ++ abstract, logical, analytical thinking<br/> + deepened expertise in biological specialist field<br/> + independent learning and (research-based) working<br/> + data presentation and evidence-based discussion (written and spoken)<br/> + (scientific) communication skills</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Module contents                      | <p><b>Vorlesung Allgemeine Ökologie:</b> 2 SWS im Wintersemester (Theoretische Grundlagen, Ressourcen, Populationsökologie, biologische Interaktionen, Lebensgemeinschaften, Ökosysteme)</p> <p><b>Praktika/Seminare:</b> 4 SWS im folgenden Sommersemester:<br/> Es sind 2 Praktika aus unterschiedlichen Praktikaangeboten zu wählen, z.B.</p> <ul style="list-style-type: none"> <li>• <b>PR/S Vegetationsökologie / Naturschutz:</b> Vegetationskundliche Aufnahmemethoden (Artenzusammensetzung, Struktur), Nährstoffverhältnisse des Oberbodens, Mikroklima, Naturschutzprojekte</li> <li>• <b>PR/S Zoo-Ökologie:</b> Repräsentative Fragestellungen der (terrestrischen) Freiland-Ökologie, Problematik von Erfassungsmethoden sowie der Einfluss abiotischer und biotischer Faktoren auf Struktur und Dynamik von Populationen, Arbeiten im Freiland, Auswertungen im Labor</li> <li>• <b>PR/SE Funktionelle Ökologie der Pflanzen:</b> Analyse abiotischer Rahmenbedingungen (u.a. Mikroklima), Wasser-, Nährstoff-, Kohlenstoffhaushalt, Aspekte der Populationsbiologie, Analyse von Pflanzenbeständen (Struktur, Funktion), statistische Auswertung und Modellierung</li> <li>• <b>PR/S Aquatische Ökologie:</b> Experimentelle Analyse von Artwechselwirkungen, zum Beispiel Räuber-Beute und Konkurrenz. Experimentelles Design. Auswertung von Proben, Biomassebestimmungen, Auszählungen, Mikroskopie. Statistische Analyse. Schreiben unter wissenschaftlicher Publikationsnorm</li> <li>• <b>PR/S Benthische Ökologie:</b> Experimentelle Analyse abiotischer und biotischer Faktoren auf makrobenthische Organismen und Gemeinschaften. Salinitäts- und Temperatureinflüsse, Räuber-Beute Beziehungen, Konkurrenzeffekte, statistische Auswertung und Verfassung wissenschaftlicher Berichte.</li> </ul> <p>Gemeinsames Symposium zu den Praktikumsergebnissen (O-Woche des folgenden Wintersemesters), 4h.</p> |
| Literaturempfehlungen                | <p>VL Allgemeine Ökologie Nentwig, W., Bacher, S., Brandl, R., 2007. Ökologie kompakt. Spektrum Akademischer Verlag, Heidelberg. Vorlesungsunterlagen (Stud-IP) Vegetationsökologie / Naturschutz Zoo-Ökologie Nentwig et al., 2004. Ökologie. Spektrum Lehrbuch, Heidelberg. 466 S. Southwood, T.R.E. &amp;</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

P.A. Henderson 2000: Ecological Methods. Blackwell Science, Oxford. 574 S.  
 Funktionelle Ökologie der Pflanzen Lambers, H., F. S. Chapin , & T. L. Pons.  
 2008. Plant Physiological Ecology. New York, Springer Verlag. Aquatische  
 Ökologie Lampert, Sommer 1999: Limnoökologie. Thieme Praktikumsript  
 Benthische Ökologie Sommer, U., 2005. Biologische Meereskunde. Springer

|                                    |                                                                       |            |                                                                                                                                                                                                                                                                                                                                                              |                                   |
|------------------------------------|-----------------------------------------------------------------------|------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|
| <b>Links</b>                       |                                                                       |            |                                                                                                                                                                                                                                                                                                                                                              |                                   |
| <b>Language of instruction</b>     |                                                                       | German     |                                                                                                                                                                                                                                                                                                                                                              |                                   |
| <b>Duration (semesters)</b>        |                                                                       | 2 Semester |                                                                                                                                                                                                                                                                                                                                                              |                                   |
| <b>Module frequency</b>            |                                                                       | jährlich   |                                                                                                                                                                                                                                                                                                                                                              |                                   |
| <b>Module capacity</b>             |                                                                       | unlimited  |                                                                                                                                                                                                                                                                                                                                                              |                                   |
| Examination                        | Prüfungszeiten                                                        |            | Type of examination                                                                                                                                                                                                                                                                                                                                          |                                   |
| <b>Final exam of module</b>        | VL: Ende des Wintersemesters PR: Ende des jeweiligen Praktikumblockes |            | 2 Prüfungsleistungen:<br>1) Prüfung zur Vorlesung (Klausur; 30%) im 1. Semester des Moduls sowie<br>2) Portfolio zum Praktikum (Portfolio; 70%) im 2. Semester des Moduls<br>Zum Bestehen des Moduls müssen alle Teilleistungen bestanden sein.<br><br>Voraussetzung für die Vergabe von Kreditpunkten ist die aktive Teilnahme an:<br>Seminar und Praktikum |                                   |
| Lehrveranstaltungsform             | Comment                                                               | SWS        | Frequency                                                                                                                                                                                                                                                                                                                                                    | Workload of compulsory attendance |
| Lecture                            |                                                                       | 2          | WiSe                                                                                                                                                                                                                                                                                                                                                         | 28                                |
| Seminar                            |                                                                       | 2          | SoSe                                                                                                                                                                                                                                                                                                                                                         | 28                                |
| Practical training                 |                                                                       | 6          | SoSe                                                                                                                                                                                                                                                                                                                                                         | 84                                |
| <b>Präsenzzeit Modul insgesamt</b> |                                                                       |            |                                                                                                                                                                                                                                                                                                                                                              | <b>140 h</b>                      |

## bio325 - Pollination and Dispersal - Concepts

|                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |     |                     |                                   |
|--------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|---------------------|-----------------------------------|
| Module label                         | Pollination and Dispersal - Concepts                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |     |                     |                                   |
| Modulkürzel                          | bio325                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |     |                     |                                   |
| Credit points                        | 6.0 KP                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |     |                     |                                   |
| Workload                             | 180 h                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |     |                     |                                   |
| Verwendbarkeit des Moduls            | <ul style="list-style-type: none"><li>• Bachelor's Programme Biology (Bachelor) &gt; Akzentsetzungsmodule</li><li>• Bachelor's Programme Mathematics (Bachelor) &gt; Nebenfachmodule</li><li>• Dual-Subject Bachelor's Programme Biology (Bachelor) &gt; Akzentsetzungsmodule</li><li>• Master of Education Programme (Gymnasium) Biology (Master of Education) &gt; Mastermodule</li></ul>                                                                                                                                                                                                                                                                                           |     |                     |                                   |
| Zuständige Personen                  | <ul style="list-style-type: none"><li>• Albach, Dirk Carl (module responsibility)</li><li>• von Hagen, Klaus Bernhard (Module counselling)</li><li>• Will, Maria (Module counselling)</li><li>• Albach, Dirk Carl (Prüfungsberechtigt)</li><li>• von Hagen, Klaus Bernhard (Prüfungsberechtigt)</li><li>• Will, Maria (Prüfungsberechtigt)</li></ul>                                                                                                                                                                                                                                                                                                                                  |     |                     |                                   |
| Prerequisites                        | bio256 Flora and Fauna                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |     |                     |                                   |
| Skills to be acquired in this module | <div>+ biological knowledge</div> <div>+ knowledge of biological working methods</div> <div>+ abstract, logical, analytical thinking</div> <div>+ deepened expertise in biological specialist field</div> <div>+ independent learning and (research-based) working</div> <div>+ data presentation and evidence-based discussion (written and spoken)</div> <div>+ teamwork</div> <div>+ (scientific) communication skills</div> <div>+ project and time management</div> <div>+ knowledge of safety and environmental issues</div> <div>Extended knowledge of biodiversity and evolution of plants focusing on reproduction, dispersal, germination and establishment of plants</div> |     |                     |                                   |
| Module contents                      | L: Pollination, dispersal, germination of plants, plant breeding<br>S: Pollination and dispersal biology of plants in a systematic context                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |     |                     |                                   |
| Literatureempfehlungen               | 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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |     |                     |                                   |
| Examination                          | Prüfungszeiten                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |     | Type of examination |                                   |
| Final exam of module                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |     | portfolio           |                                   |
| Lehrveranstaltungsform               | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | SWS | Frequency           | Workload of compulsory attendance |
| Lecture                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 2   | SoSe                | 28                                |
| Seminar                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 2   | SoSe                | 28                                |
| Präsenzzeit Modul insgesamt          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |     |                     | 56 h                              |

## bio326 - Pollination and Dispersal - Methods

|                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                     |
|---------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|
| <b>Module label</b>                         | Pollination and Dispersal - Methods                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                     |
| <b>Modulkürzel</b>                          | bio326                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                     |
| <b>Credit points</b>                        | 6.0 KP                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                     |
| <b>Workload</b>                             | 180 h                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                     |
| <b>Verwendbarkeit des Moduls</b>            | <ul style="list-style-type: none"> <li>• Bachelor's Programme Biology (Bachelor) &gt; Akzentsetzungsmodule</li> <li>• Bachelor's Programme Mathematics (Bachelor) &gt; Nebenfachmodule</li> <li>• Dual-Subject Bachelor's Programme Biology (Bachelor) &gt; Akzentsetzungsmodule</li> <li>• Master of Education Programme (Gymnasium) Biology (Master of Education) &gt; Mastermodule</li> </ul>                                                                                                                                                                                               |                     |
| <b>Zuständige Personen</b>                  | <ul style="list-style-type: none"> <li>• Albach, Dirk Carl (module responsibility)</li> <li>• von Hagen, Klaus Bernhard (Module counselling)</li> <li>• Will, Maria (Module counselling)</li> <li>• Albach, Dirk Carl (Prüfungsberechtigt)</li> <li>• von Hagen, Klaus Bernhard (Prüfungsberechtigt)</li> <li>• Will, Maria (Prüfungsberechtigt)</li> </ul>                                                                                                                                                                                                                                    |                     |
| <b>Prerequisites</b>                        | bio325 Pollination and dispersal concepts<br>bio256 Flora/Fauna                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                     |
| <b>Skills to be acquired in this module</b> | + biological knowledge<br>+ knowledge of biological working methods<br>+ abstract, logical, analytical thinking<br>+ deepened expertise in biological specialist field<br>+ independent learning and (research-based) working<br>+ data presentation and evidence-based discussion (written and spoken)<br>+ teamwork<br>+ (scientific) communication skills<br>+ project and time management<br>+ knowledge of safety and environmental issues<br><br>Extended knowledge of biodiversity and evolution of plants focusing on reproduction, dispersal, germination and establishment of plants |                     |
| <b>Module contents</b>                      | Pollination, fertilisation, dispersal and germination biological experiments in regard of adaptation to environmental factors                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                     |
| <b>Literatureempfehlungen</b>               | 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.                                                                                                                                                                                                                                                                                                                             |                     |
| <b>Links</b>                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                     |
| <b>Language of instruction</b>              | German                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                     |
| <b>Duration (semesters)</b>                 | 1 Semester                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                     |
| <b>Module frequency</b>                     | The module will be offered every other year                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                     |
| <b>Module capacity</b>                      | 12                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                     |
| Examination                                 | Prüfungszeiten                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Type of examination |
| <b>Final exam of module</b>                 | Portfolio                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                     |
| <b>Lehrveranstaltungsform</b>               | Exercises                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                     |
| <b>SWS</b>                                  | 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                     |
| <b>Frequency</b>                            | SoSe                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                     |

## bio327 - Pollination and Dispersal - Methods not just for Schools

|                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                     |
|---------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|
| <b>Module label</b>                         | Pollination and Dispersal - Methods not just for Schools                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                     |
| <b>Modulkürzel</b>                          | bio327                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                     |
| <b>Credit points</b>                        | 9.0 KP                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                     |
| <b>Workload</b>                             | 270 h                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                     |
| <b>Verwendbarkeit des Moduls</b>            | <ul style="list-style-type: none"> <li>• Bachelor's Programme Biology (Bachelor) &gt; Akzentsetzungsmodule</li> <li>• Bachelor's Programme Mathematics (Bachelor) &gt; Nebenfachmodule</li> <li>• Dual-Subject Bachelor's Programme Biology (Bachelor) &gt; Akzentsetzungsmodule</li> <li>• Master of Education Programme (Gymnasium) Biology (Master of Education) &gt; Mastermodule</li> </ul>                                                                                                                                                                                               |                     |
| <b>Zuständige Personen</b>                  | <ul style="list-style-type: none"> <li>• Albach, Dirk Carl (module responsibility)</li> <li>• von Hagen, Klaus Bernhard (Module counselling)</li> <li>• Will, Maria (Module counselling)</li> <li>• Albach, Dirk Carl (Prüfungsberechtigt)</li> <li>• von Hagen, Klaus Bernhard (Prüfungsberechtigt)</li> <li>• Will, Maria (Prüfungsberechtigt)</li> </ul>                                                                                                                                                                                                                                    |                     |
| <b>Prerequisites</b>                        | bio325 Pollination and dispersal concepts<br>bio256 Flora/fauna                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                     |
| <b>Skills to be acquired in this module</b> | + biological knowledge<br>+ knowledge of biological working methods<br>+ abstract, logical, analytical thinking<br>+ deepened expertise in biological specialist field<br>+ independent learning and (research-based) working<br>+ data presentation and evidence-based discussion (written and spoken)<br>+ teamwork<br>+ (scientific) communication skills<br>+ project and time management<br>+ knowledge of safety and environmental issues<br><br>Extended knowledge of biodiversity and evolution of plants focusing on reproduction, dispersal, germination and establishment of plants |                     |
| <b>Module contents</b>                      | 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.                                                                                                                                                                                                                                                                                                                                                 |                     |
| <b>Literaturempfehlungen</b>                | 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.                                                                                                                                                                                                                                                                                                                             |                     |
| <b>Links</b>                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                     |
| <b>Language of instruction</b>              | German                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                     |
| <b>Duration (semesters)</b>                 | 1 Semester                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                     |
| <b>Module frequency</b>                     | Das Modul findet alle zwei Jahre statt.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                     |
| <b>Module capacity</b>                      | 12                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                     |
| Examination                                 | Prüfungszeiten                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Type of examination |
| <b>Final exam of module</b>                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | portfolio           |
| <b>Lehrveranstaltungsform</b>               | Exercises                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                     |
| <b>SWS</b>                                  | 6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                     |
| <b>Frequency</b>                            | SoSe                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                     |

## bio330 - Marine Ecology

|                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |     |                                                                                                                                                                                                                                       |                                   |
|--------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|
| Module label                         | Marine Ecology                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |     |                                                                                                                                                                                                                                       |                                   |
| Modulkürzel                          | bio330                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |     |                                                                                                                                                                                                                                       |                                   |
| Credit points                        | 15.0 KP                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |     |                                                                                                                                                                                                                                       |                                   |
| Workload                             | 450 h                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |     |                                                                                                                                                                                                                                       |                                   |
| Verwendbarkeit des Moduls            | <ul style="list-style-type: none"><li>• Bachelor's Programme Biology (Bachelor) &gt; Akzentsetzungsmodule</li><li>• Dual-Subject Bachelor's Programme Biology (Bachelor) &gt; Akzentsetzungsmodule</li><li>• Master of Education Programme (Gymnasium) Biology (Master of Education) &gt; Mastermodule</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |     |                                                                                                                                                                                                                                       |                                   |
| Zuständige Personen                  | <ul style="list-style-type: none"><li>• Moorthi, Stefanie (Module counselling)</li><li>• Hillebrand, Helmut (module responsibility)</li><li>• Hillebrand, Helmut (Prüfungsberechtigt)</li><li>• Moorthi, Stefanie (Prüfungsberechtigt)</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |     |                                                                                                                                                                                                                                       |                                   |
| Prerequisites                        | Abschluss der Basismodule                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |     |                                                                                                                                                                                                                                       |                                   |
| Skills to be acquired in this module | [nop] ++ 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[/nop] 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. Presence time 24 h, additional study time 66h, winter-term Abiotic environmental conditions in marine systems (light, temperature, chemical and physical proper-ties of the water, waves, tides, global distribution of water masses and currents. Pelagic communities, plankton (phyt-, zoo,- bacterio-, viroplankton), microbial loop, sedimentation, C- and N cycling, Nekton, Fisheries, El Nino, Benthic communities, estuaries. Exercise Concepts in marine ecology 6 SWS. 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. 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. |     |                                                                                                                                                                                                                                       |                                   |
| Literatureempfehlungen               | C.M. Lalli, T.R. Parsons, Biological Oceanography: An Introduction, Elsevier, Oxford. U. Sommer, Biologische Meereskunde, Springer Verlag, Heidelberg.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |     |                                                                                                                                                                                                                                       |                                   |
| Links                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |     |                                                                                                                                                                                                                                       |                                   |
| Language of instruction              | German                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |     |                                                                                                                                                                                                                                       |                                   |
| Duration (semesters)                 | 2 Semester                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |     |                                                                                                                                                                                                                                       |                                   |
| Module frequency                     | jährlich                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |     |                                                                                                                                                                                                                                       |                                   |
| Module capacity                      | unlimited                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |     |                                                                                                                                                                                                                                       |                                   |
| Examination                          | Prüfungszeiten                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |     | Type of examination                                                                                                                                                                                                                   |                                   |
| Final exam of module                 | Written exam at the end of the Lecture Marine Ecology                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |     | 1 written exam (Lecture) (50%),<br>1 oral presentation (Exercise) (50%)<br><br>PLEASE NOTE:<br>Additional conditions regarding attendance and ungraded activities as determined by the persons responsible for the module will apply. |                                   |
| Lehrveranstaltungsform               | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | SWS | Frequency                                                                                                                                                                                                                             | Workload of compulsory attendance |
| Lecture                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 4   |                                                                                                                                                                                                                                       | 56                                |
| Exercises                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 6   |                                                                                                                                                                                                                                       | 84                                |
| Präsenzzeit Modul insgesamt          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |     |                                                                                                                                                                                                                                       | 140 h                             |



## bio340 - Morphology, Phylogeny, and Evolution of Metazoa

|                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |            |                                                                                                                                                                                                                         |                                          |
|---------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|
| <b>Module label</b>                         | Morphology, Phylogeny, and Evolution of Metazoa                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |            |                                                                                                                                                                                                                         |                                          |
| <b>Modulkürzel</b>                          | bio340                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |            |                                                                                                                                                                                                                         |                                          |
| <b>Credit points</b>                        | 15.0 KP                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |            |                                                                                                                                                                                                                         |                                          |
| <b>Workload</b>                             | 450 h                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |            |                                                                                                                                                                                                                         |                                          |
| <b>Verwendbarkeit des Moduls</b>            | <ul style="list-style-type: none"> <li>• Bachelor's Programme Biology (Bachelor) &gt; Akzentsetzungsmodule</li> <li>• Dual-Subject Bachelor's Programme Biology (Bachelor) &gt; Akzentsetzungsmodule</li> <li>• Master of Education Programme (Gymnasium) Biology (Master of Education) &gt; Mastermodule</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |            |                                                                                                                                                                                                                         |                                          |
| <b>Zuständige Personen</b>                  | <ul style="list-style-type: none"> <li>• Bininda-Emonds, Olaf (module responsibility)</li> <li>• Ahlrichs, Wilko (Module counselling)</li> <li>• Bininda-Emonds, Olaf (Prüfungsberechtigt)</li> <li>• Ahlrichs, Wilko (Prüfungsberechtigt)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |            |                                                                                                                                                                                                                         |                                          |
| <b>Prerequisites</b>                        | Abschluss der Basismodule                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |            |                                                                                                                                                                                                                         |                                          |
| <b>Skills to be acquired in this module</b> | <p>++ biological knowledge<br/> + knowledge of biological working methods<br/> ++ biologically relevant knowledge in the natural sciences and mathematics<br/> + statistics &amp; scientific programming<br/> + interdisciplinary knowledge &amp; thinking<br/> + abstract, logical, analytical thinking<br/> ++ deepened expertise in biological specialist field<br/> + independent learning and (research-based) working<br/> ++ data presentation and evidence-based discussion (written and spoken)<br/> + teamwork<br/> ++ (scientific) communication skills<br/> + project and time management</p> <p>Upon successful completion of the module the students will gain:<br/> 1. a survey of topical subjects relating to the morphology and phylogeny of animals,<br/> 2. a thorough knowledge of the development of morphological characteristics,<br/> 3. technical skills in studying morphological structures, and<br/> 4. knowledge into recent hypotheses on the phylogeny of animals.</p> |            |                                                                                                                                                                                                                         |                                          |
| <b>Module contents</b>                      | <p>Lecture: Details regarding the morphology and evolution of Metazoa from an explicit phylogenetic framework<br/> Seminar: Presentation and discussion of recent subjects and issues relating to the evolution of Metazoa; presentation of individual metazoan taxa<br/> 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)</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |            |                                                                                                                                                                                                                         |                                          |
| <b>Literatureempfehlungen</b>               | Relevant literature will be announced during the first seminar and is contingent on the latest developments in the research field.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |            |                                                                                                                                                                                                                         |                                          |
| <b>Links</b>                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |            |                                                                                                                                                                                                                         |                                          |
| <b>Language of instruction</b>              | German                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |            |                                                                                                                                                                                                                         |                                          |
| <b>Duration (semesters)</b>                 | 1 Semester                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |            |                                                                                                                                                                                                                         |                                          |
| <b>Module frequency</b>                     | jährlich                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |            |                                                                                                                                                                                                                         |                                          |
| <b>Module capacity</b>                      | unlimited                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |            |                                                                                                                                                                                                                         |                                          |
| <b>Examination</b>                          | <b>Prüfungszeiten</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |            | <b>Type of examination</b>                                                                                                                                                                                              |                                          |
| <b>Final exam of module</b>                 | 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.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |            | 1 Written examination (50%),<br>1 Portfolio (50%),<br><br><b>PLEASE NOTE:</b><br>Additional conditions regarding attendance and ungraded activities as determined by the persons responsible for the module will apply. |                                          |
| <b>Lehrveranstaltungsform</b>               | <b>Comment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <b>SWS</b> | <b>Frequency</b>                                                                                                                                                                                                        | <b>Workload of compulsory attendance</b> |
| Lecture                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 2          |                                                                                                                                                                                                                         | 28                                       |
| Exercises                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 5          |                                                                                                                                                                                                                         | 70                                       |
| Seminar                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 2          |                                                                                                                                                                                                                         | 28                                       |
| <b>Präsenzzeit Modul insgesamt</b>          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |            |                                                                                                                                                                                                                         | 126 h                                    |

## bio355 - Microscopical Anatomy

|                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                            |                  |                                          |
|---------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|------------------|------------------------------------------|
| <b>Module label</b>                         | Microscopical Anatomy                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                            |                  |                                          |
| <b>Modulkürzel</b>                          | bio355                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                            |                  |                                          |
| <b>Credit points</b>                        | 9.0 KP                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                            |                  |                                          |
| <b>Workload</b>                             | 270 h                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                            |                  |                                          |
| <b>Verwendbarkeit des Moduls</b>            | <ul style="list-style-type: none"> <li>• Bachelor's Programme Biology (Bachelor) &gt; Akzentsetzungsmodule</li> <li>• Bachelor's Programme Mathematics (Bachelor) &gt; Nebenfachmodule</li> <li>• Dual-Subject Bachelor's Programme Biology (Bachelor) &gt; Akzentsetzungsmodule</li> <li>• Master of Education Programme (Gymnasium) Biology (Master of Education) &gt; Mastermodule</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                            |                  |                                          |
| <b>Zuständige Personen</b>                  | <ul style="list-style-type: none"> <li>• Ahlrichs, Wilko (module responsibility)</li> <li>• Kieneke, Alexander (Module counselling)</li> <li>• Hoppenrath, Mona (Module counselling)</li> <li>• Ahlrichs, Wilko (Prüfungsberechtigt)</li> <li>• Hoppenrath, Mona (Prüfungsberechtigt)</li> <li>• Kieneke, Alexander (Prüfungsberechtigt)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                            |                  |                                          |
| <b>Prerequisites</b>                        | Abschluss der Basismodule                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                            |                  |                                          |
| <b>Skills to be acquired in this module</b> | <p>           ++ biological knowledge<br/>           ++ knowledge of biological working methods<br/>           ++ biologically relevant knowledge in the natural sciences and mathematics<br/>           + interdisciplinary knowledge &amp; thinking<br/>           ++ abstract, logical, analytical thinking<br/>           ++ deepened expertise in biological specialist field<br/>           ++ independent learning and (research-based) working<br/>           ++ data presentation and evidence-based discussion (written and spoken)<br/>           + teamwork<br/>           ++ (scientific) communication skills<br/>           + project and time management<br/>           + knowledge of safety and environmental issues         </p> <p>           This course is designed for students to learn about the basic light and electron optical methods.<br/>           Students will be able to work with preparative techniques for scanning electron microscopy, trans-mission electron microscopy, and light microscopy, and confocal scanning laser microscopy.<br/>           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.<br/>           Students will be introduced to the principles of light microscopy utilizing different optical systems and will have the opportunity to have hands-on experience with a Leica photomicroscope as well as the Leica SP5 confocal laser scanning.         </p> |                            |                  |                                          |
| <b>Module contents</b>                      | <p>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 anatomy - 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.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                            |                  |                                          |
| <b>Literatureempfehlungen</b>               | Will be announced in the course.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                            |                  |                                          |
| <b>Links</b>                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                            |                  |                                          |
| <b>Language of instruction</b>              | German                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                            |                  |                                          |
| <b>Duration (semesters)</b>                 | 1 Semester                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                            |                  |                                          |
| <b>Module frequency</b>                     | annually                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                            |                  |                                          |
| <b>Module capacity</b>                      | 8 ( For more applicants than places, a motivation letter decides on the admission. )                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                            |                  |                                          |
| <b>Examination</b>                          | <b>Prüfungszeiten</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <b>Type of examination</b> |                  |                                          |
| <b>Final exam of module</b>                 | end of module                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | portfolio                  |                  |                                          |
| <b>Lehrveranstaltungsform</b>               | <b>Comment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <b>SWS</b>                 | <b>Frequency</b> | <b>Workload of compulsory attendance</b> |
| Vorlesung und Seminar                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 2                          | WiSe             | 28                                       |

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| Lehrveranstaltungsform             | Comment | SWS | Frequency | Workload of compulsory attendance |
|------------------------------------|---------|-----|-----------|-----------------------------------|
| Exercises                          |         | 3.5 | WiSe      | 49                                |
| <b>Präsenzzeit Modul insgesamt</b> |         |     |           | <b>77 h</b>                       |

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## bio360 - Marine Biodiversity

|                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|--------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Module label                         | Marine Biodiversity                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Modulkürzel                          | bio360                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Credit points                        | 15.0 KP                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Workload                             | 450 h                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Verwendbarkeit des Moduls            | <ul style="list-style-type: none"><li>• Bachelor's Programme Biology (Bachelor) &gt; Akzentsetzungsmodule</li><li>• Dual-Subject Bachelor's Programme Biology (Bachelor) &gt; Akzentsetzungsmodule</li><li>• Master of Education Programme (Gymnasium) Biology (Master of Education) &gt; Mastermodule</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Zuständige Personen                  | <ul style="list-style-type: none"><li>• Martinez Arbizu, Pedro Miguel (module responsibility)</li><li>• Hoppenrath, Mona (Module counselling)</li><li>• Martinez Arbizu, Pedro Miguel (Prüfungsberechtigt)</li><li>• Hoppenrath, Mona (Prüfungsberechtigt)</li><li>• Wehrmann, Achim (Prüfungsberechtigt)</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Prerequisites                        | Abschluss der Basismodule                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Skills to be acquired in this module | <p>++ biological knowledge<br/>++ knowledge of biological working methods<br/>+ interdisciplinary knowledge &amp; thinking<br/>+ abstract, logical, analytical thinking<br/>++ deepened expertise in biological specialist field<br/>++ independent learning and (research-based) working<br/>++ data presentation and evidence-based discussion (written and spoken)<br/>+ teamwork<br/>+ (scientific) communication skills<br/>+ project and time management</p> <p>By active participation the students acquire the following knowledge/abilities/qualification:</p> <p>* Preparation and organization of sampling</p> <p>* Keeping organisms – field study</p> <p>* Marine deposits, development of marine sediments and their effects on the fauna</p> <p>* Methods of meiofauna and macrofauna sampling, also plankton sampling</p> <p>* Methods of quantitative community analysis</p> <p>* Diversity comparison of various sites applying statistical methods</p> <p>* Multivariate statistics for correlation of biocenoses and environmental variables</p> <p>* Biocenoses of marine habitats</p> <p>* Biology, morphology, systematics, behaviour and ecology of selected taxa in marine water systems</p> <p>* Formulation and definition of scientific questions and selection of methods</p> <p>* Habitat and biocenoses, interstitial, littoral (lotic, lenitic), diversity</p> <p>* Planning behavioural experiments</p> <p>* Presentation and discussion of scientific results</p> <p>* Independent scientific work in groups and presentation of results</p> |
| 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.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Literatureempfehlungen               | Literatur: EMSCHERMANN, P., HOFRICHTER, O., KÖRNER, H. & D., ZISSLER, 1992: Meeresbiologische Exkursion – Beobachtung und Experiment. Gustav Fischer Verlag, Stuttgart, Jena, New York.<br>GIERE, O., 2009: Meiobenthology – The Microscopic Motile Fauna of Aquatic Sediments. Springer Verlag, Berlin-Heidelberg.<br>GRZIMEK, B., 1979: Grzimeks Tierleben. 13 Bände. Dtv.<br>GRUNER, H.-E., 1993: Urania Tierreich. 6 Bände. Urania-Verlag Leipzig, Jena, Berlin.<br>GRUNER, H.-E., 1993: „Der Kaestner“, A., Lehrbuch der speziellen Zoologie. All volumes, Gustav Fischer Verlag, Jena, Stuttgart.<br>HAYWARD, P. NELSON-SMITH, T., SHIELDS, C. & M. KREMER, 2008: Der neue Kosmos Strandführer - 1500 Arten der Küsten Europas. Franckh-Kosmos                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

Verlag.

HEMPEL, G., HEMPEL, I. & S. SCHIEL, 2006: Faszination Meeresforschung – Ein ökologisches Lesebuch. Hausschild.

HIGGINS, R.P. & H., THIEL, 1988: Introduction to the Study of Meiofauna. Smithsonian Institution Press, Washington, D.C., London.

RUNDLE, S.D., ROBERTSON, A.L. & J.M. SCHMID-ARAYA, 2002: Freshwater Meiofauna: Biology and Ecology. Backhuys Publishers, Leiden.

SOMMER, U., 2005: Biologische Meereskunde. 2. Auflage, Springer Verlag, Berlin, Heidelberg.

TARDENT, P., 1993: Meeresbiologie, eine Einführung. 2. Auflage, Georg Thieme Verlag, Stuttgart, New York.

WESTHEIDE, W. & R., RIEGER, 2007/2004: Spezielle Zoologie. Band I, II. Gustav Fischer Verlag, Stuttgart, Jena.

The literature listed above is available in the university library. More reading will be recommended in the course of the lecture.

Literature inquiry:

web of science: [externhttp://www.bis.uni-oldenburg.de](http://www.bis.uni-oldenburg.de) - Datenbanken(DBIS) - Biologie - TOP-Datenbanken z. B. ASFA, Science Citation Index, Zoological Record

<http://www.biodiversitylibrary.org/bibliography/14107>

[externhttp://scholar.google.de/](http://scholar.google.de/)

[externhttp://www.vifabio.de](http://www.vifabio.de)

Open access journals: [externhttp://www.doaj.org/](http://www.doaj.org/) -

[externhttp://www.plosone.org](http://www.plosone.org)

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|--------------------------------------------------------------------------------------------------------------------------------------------------------|---------|-----------------|---------------------|-----------------------------------|
| Links                                                                                                                                                  |         |                 |                     |                                   |
| Language of instruction                                                                                                                                |         | German          |                     |                                   |
| Duration (semesters)                                                                                                                                   |         | 1 Semester      |                     |                                   |
| Module frequency                                                                                                                                       |         | jährlich        |                     |                                   |
| Module capacity                                                                                                                                        |         | unlimited       |                     |                                   |
| Examination                                                                                                                                            |         | Prüfungszeiten  | Type of examination |                                   |
| Final exam of module                                                                                                                                   |         | During lectures | 1 Portfolio         |                                   |
| PLEASE NOTE:<br>Additional conditions regarding attendance and ungraded activities as determined by the persons responsible for the module will apply. |         |                 |                     |                                   |
| Lehrveranstaltungsform                                                                                                                                 | Comment | SWS             | Frequency           | Workload of compulsory attendance |
| Lecture                                                                                                                                                |         | 2               |                     | 28                                |
| Exercises                                                                                                                                              |         | 9               |                     | 126                               |
| Seminar                                                                                                                                                |         | 2               |                     | 28                                |
| Präsenzzeit Modul insgesamt                                                                                                                            |         |                 |                     | 182 h                             |

## bio375 - Flora - Advanced Concepts

|                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |     |                     |                                   |
|--------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|---------------------|-----------------------------------|
| Module label                         | Flora - Advanced Concepts                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |     |                     |                                   |
| Modulkürzel                          | bio375                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |     |                     |                                   |
| Credit points                        | 6.0 KP                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |     |                     |                                   |
| Workload                             | 180 h                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |     |                     |                                   |
| Verwendbarkeit des Moduls            | <ul style="list-style-type: none"><li>• Bachelor's Programme Biology (Bachelor) &gt; Akzentsetzungsmodule</li><li>• Bachelor's Programme Mathematics (Bachelor) &gt; Nebenfachmodule</li><li>• Dual-Subject Bachelor's Programme Biology (Bachelor) &gt; Akzentsetzungsmodule</li><li>• Master of Education Programme (Gymnasium) Biology (Master of Education) &gt; Mastermodule</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |     |                     |                                   |
| Zuständige Personen                  | <ul style="list-style-type: none"><li>• Albach, Dirk Carl (module responsibility)</li><li>• von Hagen, Klaus Bernhard (Module counselling)</li><li>• Will, Maria (Module counselling)</li><li>• Albach, Dirk Carl (Prüfungsberechtigt)</li><li>• von Hagen, Klaus Bernhard (Prüfungsberechtigt)</li><li>• Will, Maria (Prüfungsberechtigt)</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |     |                     |                                   |
| Prerequisites                        | bio256 Flora and Fauna                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |     |                     |                                   |
| Skills to be acquired in this module | <div><div><div>+ biological knowledge</div><div>+ knowledge of biological working methods</div><div>+ deepened expertise in biological specialist field</div><div>+ independent learning and (research-based) working</div><div>+ data presentation and evidence-based discussion (written and spoken)</div><div>+ (scientific) communication skills</div><div>+ knowledge of safety and environmental issues</div></div><div><div>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 natuer conservation to sensibelize 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.</div></div></div> |     |                     |                                   |
| Module contents                      | <div><div>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.</div><div>The seminar is intended to let students study in-depth additional plant families with their typical characters.</div></div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |     |                     |                                   |
| Literatureempfehlungen               | 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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |     |                     |                                   |
| Examination                          | Prüfungszeiten                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |     | Type of examination |                                   |
| Final exam of module                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |     | portfolio           |                                   |
| Lehrveranstaltungsform               | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | SWS | Frequency           | Workload of compulsory attendance |
| Lecture                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 2   | SoSe                | 28                                |
| Seminar                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 2   | SoSe                | 28                                |
| Präsenzzeit Modul insgesamt          | 56 h                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |     |                     |                                   |

## bio376 - Flora - Advanced Methods

|                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                     |
|---------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|
| <b>Module label</b>                         | Flora - Advanced Methods                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                     |
| <b>Modulkürzel</b>                          | bio376                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                     |
| <b>Credit points</b>                        | 6.0 KP                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                     |
| <b>Workload</b>                             | 180 h                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                     |
| <b>Verwendbarkeit des Moduls</b>            | <ul style="list-style-type: none"> <li>• Bachelor's Programme Biology (Bachelor) &gt; Akzentsetzungsmodule</li> <li>• Bachelor's Programme Mathematics (Bachelor) &gt; Nebenfachmodule</li> <li>• Dual-Subject Bachelor's Programme Biology (Bachelor) &gt; Akzentsetzungsmodule</li> <li>• Master of Education Programme (Gymnasium) Biology (Master of Education) &gt; Mastermodule</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                     |
| <b>Zuständige Personen</b>                  | <ul style="list-style-type: none"> <li>• Albach, Dirk Carl (module responsibility)</li> <li>• von Hagen, Klaus Bernhard (Module counselling)</li> <li>• Will, Maria (Module counselling)</li> <li>• Albach, Dirk Carl (Prüfungsberechtigt)</li> <li>• von Hagen, Klaus Bernhard (Prüfungsberechtigt)</li> <li>• Will, Maria (Prüfungsberechtigt)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                     |
| <b>Prerequisites</b>                        | bio256 Flora and Fauna<br>bio375 Flora - Advanced concepts                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                     |
| <b>Skills to be acquired in this module</b> | <p>             + biological knowledge<br/>             + knowledge of biological working methods<br/>             + deepened expertise in biological specialist field<br/>             + independent learning and (research-based) working<br/>             + data presentation and evidence-based discussion (written and spoken)<br/>             + (scientific) communication skills<br/>             + knowledge of safety and environmental issues           </p> <p>             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 sensitize 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.           </p> |                     |
| <b>Module contents</b>                      | 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.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                     |
| <b>Literatureempfehlungen</b>               | Rothmaler - Exkursionsflora von Deutschland. Gefäßpflanzen: Grundband                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                     |
| <b>Links</b>                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                     |
| <b>Language of instruction</b>              | German                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                     |
| <b>Duration (semesters)</b>                 | 1 Semester                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                     |
| <b>Module frequency</b>                     | The module will be offered every other year                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                     |
| <b>Module capacity</b>                      | 12                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                     |
| Examination                                 | Prüfungszeiten                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Type of examination |
| <b>Final exam of module</b>                 | portfolio                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                     |
| <b>Lehrveranstaltungsform</b>               | Exercises                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                     |
| <b>SWS</b>                                  | 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                     |
| <b>Frequency</b>                            | SoSe                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                     |

## bio377 - Flora - Advanced Methods not just for schools

|                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                     |
|---------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|
| <b>Module label</b>                         | Flora - Advanced Methods not just for schools                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                     |
| <b>Modulkürzel</b>                          | bio377                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                     |
| <b>Credit points</b>                        | 9.0 KP                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                     |
| <b>Workload</b>                             | 270 h                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                     |
| <b>Verwendbarkeit des Moduls</b>            | <ul style="list-style-type: none"> <li>• Bachelor's Programme Biology (Bachelor) &gt; Akzentsetzungsmodule</li> <li>• Bachelor's Programme Mathematics (Bachelor) &gt; Nebenfachmodule</li> <li>• Dual-Subject Bachelor's Programme Biology (Bachelor) &gt; Akzentsetzungsmodule</li> <li>• Master of Education Programme (Gymnasium) Biology (Master of Education) &gt; Mastermodule</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                     |
| <b>Zuständige Personen</b>                  | <ul style="list-style-type: none"> <li>• Albach, Dirk Carl (module responsibility)</li> <li>• von Hagen, Klaus Bernhard (Module counselling)</li> <li>• Will, Maria (Module counselling)</li> <li>• Albach, Dirk Carl (Prüfungsberechtigt)</li> <li>• von Hagen, Klaus Bernhard (Prüfungsberechtigt)</li> <li>• Will, Maria (Prüfungsberechtigt)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                     |
| <b>Prerequisites</b>                        | bio375 Flora - Advanced Concepts<br>bio256 Flora and Fauna                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                     |
| <b>Skills to be acquired in this module</b> | <p>             + biological knowledge<br/>             + knowledge of biological working methods<br/>             + deepened expertise in biological specialist field<br/>             + independent learning and (research-based) working<br/>             + data presentation and evidence-based discussion (written and spoken)<br/>             + (scientific) communication skills<br/>             + knowledge of safety and environmental issues           </p> <p>             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 sensitize 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.           </p> |                     |
| <b>Module contents</b>                      | The exercises will be used to apply the abilities to identify plant species in the vicinity of Oldenburg and to practice methods in mapping and surveying plant species. Investigations applicable to school lessons will be presented and especially thoroughly discussed.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                     |
| <b>Literatureempfehlungen</b>               | Rothmaler - Exkursionsflora von Deutschland. Gefäßpflanzen: Grundband                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                     |
| <b>Links</b>                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                     |
| <b>Language of instruction</b>              | German                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                     |
| <b>Duration (semesters)</b>                 | 1 Semester                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                     |
| <b>Module frequency</b>                     | The module will be offered every other year                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                     |
| <b>Module capacity</b>                      | 12                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                     |
| Examination                                 | Prüfungszeiten                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Type of examination |
| <b>Final exam of module</b>                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | portfolio           |
| <b>Lehrveranstaltungsform</b>               | Exercises                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                     |
| <b>SWS</b>                                  | 6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                     |
| <b>Frequency</b>                            | SoSe                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                     |

## bio385 - Specific Microbiology

|                                             |                                                                                                                                                                                                                                                                                                                      |     |                              |                                   |
|---------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------------------------------|-----------------------------------|
| <b>Module label</b>                         | Specific Microbiology                                                                                                                                                                                                                                                                                                |     |                              |                                   |
| <b>Modulkürzel</b>                          | bio385                                                                                                                                                                                                                                                                                                               |     |                              |                                   |
| <b>Credit points</b>                        | 12.0 KP                                                                                                                                                                                                                                                                                                              |     |                              |                                   |
| <b>Workload</b>                             | 360 h                                                                                                                                                                                                                                                                                                                |     |                              |                                   |
| <b>Verwendbarkeit des Moduls</b>            | <ul style="list-style-type: none"> <li>• Bachelor's Programme Biology (Bachelor) &gt; Akzentsetzungsmodule</li> <li>• Dual-Subject Bachelor's Programme Biology (Bachelor) &gt; Akzentsetzungsmodule</li> <li>• Master of Education Programme (Gymnasium) Biology (Master of Education) &gt; Mastermodule</li> </ul> |     |                              |                                   |
| <b>Zuständige Personen</b>                  | <ul style="list-style-type: none"> <li>• Rabus, Ralf Andreas (module responsibility)</li> <li>• Rabus, Ralf Andreas (Prüfungsberechtigt)</li> <li>• Wünsch, Daniel (Prüfungsberechtigt)</li> </ul>                                                                                                                   |     |                              |                                   |
| <b>Prerequisites</b>                        | bio233 Basics in microbiology and genetics<br>bio265 general microbiology                                                                                                                                                                                                                                            |     |                              |                                   |
| <b>Skills to be acquired in this module</b> | THEORIE: verschiedene Kultivierungsstrategien (batch, fed-batch, kontinuierlich) und physiologische Interpretation von Meßparametern (Wachstumsraten, Respirationsraten, Ertrag) PRAXIS: apparatives Verständnis von und praktischer Umgang mit Bioreaktoren inkl. Sensorsystemen                                    |     |                              |                                   |
| <b>Module contents</b>                      | Grundlagen der Prozess-kontrollierten Kultivierung in Bioreaktoren TEIL A: Umgang mit Bioreaktoren inkl. Analyse und Regelung von Prozess-Parametern TEIL B: Kultivierung mariner Bakterien unter definierten Bedingungen im Bioreaktor, Bilanzierung von Stoffwechselaktivitäten                                    |     |                              |                                   |
| <b>Literaturempfehlungen</b>                | Schmauder HP (1994) Methoden der Biotechnologie, Kapitel 3.2.2. Gustav Fischer Verlag Jena Chmiel H, Briechele S (1991) Bioprozesstechnik. Gustav Fischer Verlag Stuttgart                                                                                                                                           |     |                              |                                   |
| <b>Links</b>                                | <a href="http://www.icbm.de/ammb">www.icbm.de/ammb</a>                                                                                                                                                                                                                                                               |     |                              |                                   |
| <b>Language of instruction</b>              | German                                                                                                                                                                                                                                                                                                               |     |                              |                                   |
| <b>Duration (semesters)</b>                 | 1 Semester                                                                                                                                                                                                                                                                                                           |     |                              |                                   |
| <b>Module frequency</b>                     | jährlich                                                                                                                                                                                                                                                                                                             |     |                              |                                   |
| <b>Module capacity</b>                      | 8                                                                                                                                                                                                                                                                                                                    |     |                              |                                   |
| Examination                                 | Prüfungszeiten                                                                                                                                                                                                                                                                                                       |     | Type of examination          |                                   |
| <b>Final exam of module</b>                 |                                                                                                                                                                                                                                                                                                                      |     | exam (50%)<br>protocol (50%) |                                   |
| Lehrveranstaltungsform                      | Comment                                                                                                                                                                                                                                                                                                              | SWS | Frequency                    | Workload of compulsory attendance |
| Lecture                                     |                                                                                                                                                                                                                                                                                                                      | 2   | WiSe                         | 28                                |
| Seminar                                     |                                                                                                                                                                                                                                                                                                                      | 2   | WiSe                         | 28                                |
| Practical training                          |                                                                                                                                                                                                                                                                                                                      | 6   | WiSe                         | 84                                |
| <b>Präsenzzeit Modul insgesamt</b>          |                                                                                                                                                                                                                                                                                                                      |     |                              | 140 h                             |

## bio405 - Introduction to Neurobiology I

|                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |     |                     |                                   |
|---------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|---------------------|-----------------------------------|
| <b>Module label</b>                         | Introduction to Neurobiology I                                                                                                                                                                                                                                                                                                                                                                                                                                          |     |                     |                                   |
| <b>Modulkürzel</b>                          | bio405                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |     |                     |                                   |
| <b>Credit points</b>                        | 12.0 KP                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |     |                     |                                   |
| <b>Workload</b>                             | 360 h                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |     |                     |                                   |
| <b>Verwendbarkeit des Moduls</b>            | <ul style="list-style-type: none"> <li>• Bachelor's Programme Biology (Bachelor) &gt; Akzentsetzungsmodule</li> <li>• Bachelor's Programme Mathematics (Bachelor) &gt; Nebenfachmodule</li> <li>• Dual-Subject Bachelor's Programme Biology (Bachelor) &gt; Akzentsetzungsmodule</li> <li>• Master of Education Programme (Gymnasium) Biology (Master of Education) &gt; Mastermodule</li> </ul>                                                                        |     |                     |                                   |
| <b>Zuständige Personen</b>                  | <ul style="list-style-type: none"> <li>• Greschner, Martin (module responsibility)</li> <li>• Koch, Karl-Wilhelm (Module counselling)</li> <li>• Janssen-Bienhold, Ulrike (Module counselling)</li> <li>• Janssen-Bienhold, Ulrike (Prüfungsberechtigt)</li> <li>• Greschner, Martin (Prüfungsberechtigt)</li> <li>• Koch, Karl-Wilhelm (Prüfungsberechtigt)</li> <li>• Köppl, Christine (Prüfungsberechtigt)</li> <li>• Dömer, Patrick (Prüfungsberechtigt)</li> </ul> |     |                     |                                   |
| <b>Prerequisites</b>                        | Abschluss der Basismodule                                                                                                                                                                                                                                                                                                                                                                                                                                               |     |                     |                                   |
| <b>Skills to be acquired in this module</b> | ++ deepened biological expertise<br>++ deepened knowledge of biological working methods<br>+ scientific/mathematical basic knowledge relevant for biology<br>+ critical and analytical thinking<br>++ data presentation and discussion in German (written and spoken)<br>+ teamwork                                                                                                                                                                                     |     |                     |                                   |
| <b>Module contents</b>                      | 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.                                                                    |     |                     |                                   |
| <b>Literatureempfehlungen</b>               | Purves D. et al.: Neuroscience, Sinauer Associates, Sunderland USA, latest edition                                                                                                                                                                                                                                                                                                                                                                                      |     |                     |                                   |
| <b>Links</b>                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |     |                     |                                   |
| <b>Language of instruction</b>              | German                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |     |                     |                                   |
| <b>Duration (semesters)</b>                 | 1 Semester                                                                                                                                                                                                                                                                                                                                                                                                                                                              |     |                     |                                   |
| <b>Module frequency</b>                     | annually                                                                                                                                                                                                                                                                                                                                                                                                                                                                |     |                     |                                   |
| <b>Module capacity</b>                      | 30                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |     |                     |                                   |
| <b>Reference text</b>                       | associated with the modules bio415 and bio416 Introduction to Neurobiology II in the winter semester                                                                                                                                                                                                                                                                                                                                                                    |     |                     |                                   |
| Examination                                 | Prüfungszeiten                                                                                                                                                                                                                                                                                                                                                                                                                                                          |     | Type of examination |                                   |
| <b>Final exam of module</b>                 | end of semester                                                                                                                                                                                                                                                                                                                                                                                                                                                         |     | exam and protocol   |                                   |
| Lehrveranstaltungsform                      | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | SWS | Frequency           | Workload of compulsory attendance |
| Lecture                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 3   | SoSe                | 42                                |
| Seminar                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 1   | SoSe                | 14                                |
| Exercises                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 4   | SoSe                | 56                                |
| Tutorial (optional)                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |     | SoSe und WiSe       | 0                                 |
| <b>Präsenzzeit Modul insgesamt</b>          | 112 h                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |     |                     |                                   |

## bio415 - Introduction to Neurobiology II

|                                             |                                                                                                                                                                                                                                                                                                                                                                                                  |     |                     |                                   |
|---------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|---------------------|-----------------------------------|
| <b>Module label</b>                         | Introduction to Neurobiology II                                                                                                                                                                                                                                                                                                                                                                  |     |                     |                                   |
| <b>Modulkürzel</b>                          | bio415                                                                                                                                                                                                                                                                                                                                                                                           |     |                     |                                   |
| <b>Credit points</b>                        | 6.0 KP                                                                                                                                                                                                                                                                                                                                                                                           |     |                     |                                   |
| <b>Workload</b>                             | 180 h                                                                                                                                                                                                                                                                                                                                                                                            |     |                     |                                   |
| <b>Verwendbarkeit des Moduls</b>            | <ul style="list-style-type: none"> <li>• Bachelor's Programme Biology (Bachelor) &gt; Akzentsetzungsmodule</li> <li>• Bachelor's Programme Mathematics (Bachelor) &gt; Nebenfachmodule</li> <li>• Dual-Subject Bachelor's Programme Biology (Bachelor) &gt; Akzentsetzungsmodule</li> <li>• Master of Education Programme (Gymnasium) Biology (Master of Education) &gt; Mastermodule</li> </ul> |     |                     |                                   |
| <b>Zuständige Personen</b>                  | <ul style="list-style-type: none"> <li>• Greschner, Martin (module responsibility)</li> <li>• Thiel, Christiane Margarete (Module counselling)</li> <li>• Köppl, Christine (Module counselling)</li> <li>• Greschner, Martin (Prüfungsberechtigt)</li> <li>• Thiel, Christiane Margarete (Prüfungsberechtigt)</li> <li>• Köppl, Christine (Prüfungsberechtigt)</li> </ul>                        |     |                     |                                   |
| <b>Prerequisites</b>                        | Abschluss der Basismodule                                                                                                                                                                                                                                                                                                                                                                        |     |                     |                                   |
| <b>Skills to be acquired in this module</b> | ++ deepened biological expertise<br>++ deepened knowledge of biological working methods<br>+ scientific/mathematical basic knowledge relevant for biology<br>+ critical and analytical thinking                                                                                                                                                                                                  |     |                     |                                   |
| <b>Module contents</b>                      | 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.                                                                                                             |     |                     |                                   |
| <b>Literatureempfehlungen</b>               | Purves D. et al.: Neuroscience, Sinauer Associates, Sunderland USA, latest edition                                                                                                                                                                                                                                                                                                               |     |                     |                                   |
| <b>Links</b>                                |                                                                                                                                                                                                                                                                                                                                                                                                  |     |                     |                                   |
| <b>Language of instruction</b>              | German                                                                                                                                                                                                                                                                                                                                                                                           |     |                     |                                   |
| <b>Duration (semesters)</b>                 | 1 Semester                                                                                                                                                                                                                                                                                                                                                                                       |     |                     |                                   |
| <b>Module frequency</b>                     | Wintersemester                                                                                                                                                                                                                                                                                                                                                                                   |     |                     |                                   |
| <b>Module capacity</b>                      | 30                                                                                                                                                                                                                                                                                                                                                                                               |     |                     |                                   |
| Examination                                 | Prüfungszeiten                                                                                                                                                                                                                                                                                                                                                                                   |     | Type of examination |                                   |
| <b>Final exam of module</b>                 | end of semester                                                                                                                                                                                                                                                                                                                                                                                  |     | written exam        |                                   |
| Lehrveranstaltungsform                      | Comment                                                                                                                                                                                                                                                                                                                                                                                          | SWS | Frequency           | Workload of compulsory attendance |
| Lecture                                     |                                                                                                                                                                                                                                                                                                                                                                                                  | 3   | WiSe                | 42                                |
| Seminar                                     |                                                                                                                                                                                                                                                                                                                                                                                                  | 1   | WiSe                | 14                                |
| <b>Präsenzzeit Modul insgesamt</b>          |                                                                                                                                                                                                                                                                                                                                                                                                  |     |                     | 56 h                              |

## bio420 - Biochemistry of the Cell

|                                             |                                                                                                                                                                                                                                                                                                                      |     |                     |                                   |
|---------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|---------------------|-----------------------------------|
| <b>Module label</b>                         | Biochemistry of the Cell                                                                                                                                                                                                                                                                                             |     |                     |                                   |
| <b>Modulkürzel</b>                          | bio420                                                                                                                                                                                                                                                                                                               |     |                     |                                   |
| <b>Credit points</b>                        | 6.0 KP                                                                                                                                                                                                                                                                                                               |     |                     |                                   |
| <b>Workload</b>                             | 180 h                                                                                                                                                                                                                                                                                                                |     |                     |                                   |
| <b>Verwendbarkeit des Moduls</b>            | <ul style="list-style-type: none"> <li>• Bachelor's Programme Biology (Bachelor) &gt; Akzentsetzungsmodule</li> <li>• Dual-Subject Bachelor's Programme Biology (Bachelor) &gt; Akzentsetzungsmodule</li> <li>• Master of Education Programme (Gymnasium) Biology (Master of Education) &gt; Mastermodule</li> </ul> |     |                     |                                   |
| <b>Zuständige Personen</b>                  | <ul style="list-style-type: none"> <li>• Scholten, Alexander (module responsibility)</li> <li>• Scholten, Alexander (Prüfungsberechtigt)</li> </ul>                                                                                                                                                                  |     |                     |                                   |
| <b>Prerequisites</b>                        | Abschluss der Basismodule                                                                                                                                                                                                                                                                                            |     |                     |                                   |
| <b>Skills to be acquired in this module</b> | ++ biological knowledge<br>+ knowledge of biological working methods<br>+ biologically relevant knowledge in the natural sciences and mathematics<br>+ abstract, logical, analytical thinking<br>+ data presentation and evidence-based discussion (written and spoken)<br>++ (scientific) communication skills      |     |                     |                                   |
| <b>Module contents</b>                      | supramolecular organization in the cell, interactions of biomolecules, signalling fluxes                                                                                                                                                                                                                             |     |                     |                                   |
| <b>Literatureempfehlungen</b>               | Biochemie, Müller-Esterl<br>Biochemie, Lubert Stryer<br>Lehninger Prinzipien der Biochemie, David L. Nelson und Michael M. Cox<br>Principles of Biochemistry, Horton et al.                                                                                                                                          |     |                     |                                   |
| <b>Links</b>                                |                                                                                                                                                                                                                                                                                                                      |     |                     |                                   |
| <b>Language of instruction</b>              | German                                                                                                                                                                                                                                                                                                               |     |                     |                                   |
| <b>Duration (semesters)</b>                 | 1 Semester                                                                                                                                                                                                                                                                                                           |     |                     |                                   |
| <b>Module frequency</b>                     | annually                                                                                                                                                                                                                                                                                                             |     |                     |                                   |
| <b>Module capacity</b>                      | 20                                                                                                                                                                                                                                                                                                                   |     |                     |                                   |
| Examination                                 | Prüfungszeiten                                                                                                                                                                                                                                                                                                       |     | Type of examination |                                   |
| <b>Final exam of module</b>                 | during the semester                                                                                                                                                                                                                                                                                                  |     | oral presentation   |                                   |
| Lehrveranstaltungsform                      | Comment                                                                                                                                                                                                                                                                                                              | SWS | Frequency           | Workload of compulsory attendance |
| Lecture                                     |                                                                                                                                                                                                                                                                                                                      | 1   | WiSe                | 14                                |
| Exercises                                   |                                                                                                                                                                                                                                                                                                                      | 1   | WiSe                | 14                                |
| Seminar                                     |                                                                                                                                                                                                                                                                                                                      | 2   | WiSe                | 28                                |
| <b>Präsenzzeit Modul insgesamt</b>          |                                                                                                                                                                                                                                                                                                                      |     |                     | 56 h                              |

## bio430 - Analytical Biochemistry

|                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |     |                                 |                                   |
|---------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|---------------------------------|-----------------------------------|
| <b>Module label</b>                         | Analytical Biochemistry                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |     |                                 |                                   |
| <b>Modulkürzel</b>                          | bio430                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |     |                                 |                                   |
| <b>Credit points</b>                        | 6.0 KP                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |     |                                 |                                   |
| <b>Workload</b>                             | 180 h                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |     |                                 |                                   |
| <b>Verwendbarkeit des Moduls</b>            | <ul style="list-style-type: none"> <li>• Bachelor's Programme Biology (Bachelor) &gt; Akzentsetzungsmodule</li> <li>• Dual-Subject Bachelor's Programme Biology (Bachelor) &gt; Akzentsetzungsmodule</li> <li>• Master of Education Programme (Gymnasium) Biology (Master of Education) &gt; Mastermodule</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                         |     |                                 |                                   |
| <b>Zuständige Personen</b>                  | <ul style="list-style-type: none"> <li>• Koch, Karl-Wilhelm (module responsibility)</li> <li>• Scholten, Alexander (Module counselling)</li> <li>• Koch, Karl-Wilhelm (Prüfungsberechtigt)</li> <li>• Scholten, Alexander (Prüfungsberechtigt)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |     |                                 |                                   |
| <b>Prerequisites</b>                        | Abschluss der Basismodule                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |     |                                 |                                   |
| <b>Skills to be acquired in this module</b> | <p>           ++ biological knowledge<br/>           ++ knowledge of biological working methods<br/>           + biologically relevant knowledge in the natural sciences and mathematics<br/>           + abstract, logical, analytical thinking<br/>           + deepened expertise in biological specialist field<br/>           ++ data presentation and evidence-based discussion (written and spoken)<br/>           + teamwork         </p> <p>           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.         </p> |     |                                 |                                   |
| <b>Module contents</b>                      | Bioanalytical methods in theory and practice                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |     |                                 |                                   |
| <b>Literatureempfehlungen</b>               | Bioanalytik, Lottspeich/Engels                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |     |                                 |                                   |
| <b>Links</b>                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |     |                                 |                                   |
| <b>Language of instruction</b>              | German                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |     |                                 |                                   |
| <b>Duration (semesters)</b>                 | 1 Semester                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |     |                                 |                                   |
| <b>Module frequency</b>                     | annually                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |     |                                 |                                   |
| <b>Module capacity</b>                      | 20                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |     |                                 |                                   |
| Examination                                 | Prüfungszeiten                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |     | Type of examination             |                                   |
| <b>Final exam of module</b>                 | during semester                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |     | oral presentation and protocoll |                                   |
| Lehrveranstaltungsform                      | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | SWS | Frequency                       | Workload of compulsory attendance |
| Lecture                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 1   | SoSe                            | 14                                |
| Seminar                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 1   | SoSe                            | 14                                |
| Exercises                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 2   | SoSe                            | 28                                |
| <b>Präsenzzeit Modul insgesamt</b>          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |     |                                 | 56 h                              |

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## bio440 - Microfauna, Mircoflora & Protista of limnic and marine habitats

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|--------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Module label                         | Microfauna, Mircoflora & Protista of limnic and marine habitats                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Modulkürzel                          | bio440                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Credit points                        | 6.0 KP                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Workload                             | 180 h                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Verwendbarkeit des Moduls            | <ul style="list-style-type: none"><li>• Bachelor's Programme Biology (Bachelor) &gt; Akzentsetzungsmodule</li><li>• Dual-Subject Bachelor's Programme Biology (Bachelor) &gt; Akzentsetzungsmodule</li><li>• Master of Education Programme (Gymnasium) Biology (Master of Education) &gt; Mastermodule</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Zuständige Personen                  | <ul style="list-style-type: none"><li>• Ahlrichs, Wilko (module responsibility)</li><li>• Kieneke, Alexander (Module counselling)</li><li>• Hoppenrath, Mona (Module counselling)</li><li>• Ahlrichs, Wilko (Prüfungsberechtigt)</li><li>• Kieneke, Alexander (Prüfungsberechtigt)</li><li>• Hoppenrath, Mona (Prüfungsberechtigt)</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Prerequisites                        | Abschluss der Basismodule                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Skills to be acquired in this module | <p>++ biological knowledge<br/>++ knowledge of biological working methods<br/>++ biologically relevant knowledge in the natural sciences and mathematics<br/>+ statistics &amp; scientific programming<br/>++ interdisciplinary knowledge &amp; thinking<br/>+ abstract, logical, analytical thinking<br/>++ deepened expertise in biological specialist field<br/>++ independent learning and (research-based) working<br/>++ data presentation and evidence-based discussion (written and spoken)<br/>+ teamwork<br/>++ (scientific) communication skills<br/>+ project and time management</p> <p>The objectives of the module are the teaching and learning of methods in the field of taxonomy, systematics, morphology, ecology, and evolution. Competencies 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.</p> <p>The focus is on taxa of the microfauna and protists of limnic and marine habitats.</p> <p>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.</p>                                                                                                                                                                                                                                                                                                                     |
| Module contents                      | <p>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.</p> <p>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.</p> <p>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.</p> <p>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.</p> <p>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.</p> <p>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.</p> |
| Literatureempfehlungen               | Will be announced in the course.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Links                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Language of instruction              | German                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

|                                    |         |                                                                                             |           |                                   |
|------------------------------------|---------|---------------------------------------------------------------------------------------------|-----------|-----------------------------------|
| <b>Duration (semesters)</b>        |         | 1 Semester                                                                                  |           |                                   |
| <b>Module frequency</b>            |         | irregular                                                                                   |           |                                   |
| <b>Module capacity</b>             |         | 12 (<br>For more applicants than places, a motivation letter decides on the admission.<br>) |           |                                   |
| Examination                        |         | Prüfungszeiten                                                                              |           | Type of examination               |
| <b>Final exam of module</b>        |         |                                                                                             |           | Portfolio                         |
| Lehrveranstaltungsform             | Comment | SWS                                                                                         | Frequency | Workload of compulsory attendance |
| Study trip                         |         | 1                                                                                           | SoSe      | 14                                |
| Seminar                            |         | 1                                                                                           | SoSe      | 14                                |
| Exercises                          |         | 2                                                                                           | SoSe      | 28                                |
| <b>Präsenzzeit Modul insgesamt</b> |         |                                                                                             |           | 56 h                              |

## bio450 - Posters, Pictures, Presentations and Papers

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|---------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|
| <b>Module label</b>                         | Posters, Pictures, Presentations and Papers                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                            |
| <b>Modulkürzel</b>                          | bio450                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                            |
| <b>Credit points</b>                        | 9.0 KP                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                            |
| <b>Workload</b>                             | 270 h                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                            |
| <b>Verwendbarkeit des Moduls</b>            | <ul style="list-style-type: none"> <li>• Bachelor's Programme Biology (Bachelor) &gt; Akzentsetzungsmodule</li> <li>• Dual-Subject Bachelor's Programme Biology (Bachelor) &gt; Akzentsetzungsmodule</li> <li>• Master of Education Programme (Gymnasium) Biology (Master of Education) &gt; Mastermodule</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                            |
| <b>Zuständige Personen</b>                  | <ul style="list-style-type: none"> <li>• Bininda-Emonds, Olaf (module responsibility)</li> <li>• Ahlrichs, Wilko (Module counselling)</li> <li>• Bininda-Emonds, Olaf (Prüfungsberechtigt)</li> <li>• Ahlrichs, Wilko (Prüfungsberechtigt)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                            |
| <b>Prerequisites</b>                        | Abschluss der Basismodule                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                            |
| <b>Skills to be acquired in this module</b> | <p>+ interdisciplinary knowledge &amp; thinking<br/> + abstract, logical, analytical thinking<br/> + deepened expertise in biological specialist field<br/> ++ independent learning and (research-based) working<br/> ++ data presentation and evidence-based discussion (written and spoken)<br/> ++ (scientific) communication skills<br/> + project and time management</p> <p>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.</p> |                            |
| <b>Module contents</b>                      | <p>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 mis-takes.</p> <p>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).</p>                                                                                                                                                                                                      |                            |
| <b>Literatureempfehlungen</b>               | None. The relevant scientific literature will be distributed during the course.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                            |
| <b>Links</b>                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                            |
| <b>Languages of instruction</b>             | German, English                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                            |
| <b>Duration (semesters)</b>                 | 1 Semester                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                            |
| <b>Module frequency</b>                     | annually                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                            |
| <b>Module capacity</b>                      | 10 (Letter of motivation)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                            |
| <b>Examination</b>                          | <b>Prüfungszeiten</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <b>Type of examination</b> |
| <b>Final exam of module</b>                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Portfolio (100%)           |
| <b>Lehrveranstaltungsform</b>               | Exercises                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                            |
| <b>SWS</b>                                  | 6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                            |
| <b>Frequency</b>                            | SoSe                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                            |

## bio470 - Marine Biology Field Trip

|                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |     |                     |                                   |
|---------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|---------------------|-----------------------------------|
| <b>Module label</b>                         | Marine Biology Field Trip                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |     |                     |                                   |
| <b>Modulkürzel</b>                          | bio470                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |     |                     |                                   |
| <b>Credit points</b>                        | 6.0 KP                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |     |                     |                                   |
| <b>Workload</b>                             | 180 h                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |     |                     |                                   |
| <b>Verwendbarkeit des Moduls</b>            | <ul style="list-style-type: none"> <li>• Bachelor's Programme Biology (Bachelor) &gt; Akzentsetzungsmodule</li> <li>• Dual-Subject Bachelor's Programme Biology (Bachelor) &gt; Akzentsetzungsmodule</li> <li>• Master of Education Programme (Gymnasium) Biology (Master of Education) &gt; Mastermodule</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |     |                     |                                   |
| <b>Zuständige Personen</b>                  | <ul style="list-style-type: none"> <li>• Ahlrichs, Wilko (module responsibility)</li> <li>• Kieneke, Alexander (Module counselling)</li> <li>• Ahlrichs, Wilko (Prüfungsberechtigt)</li> <li>• Kieneke, Alexander (Prüfungsberechtigt)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |     |                     |                                   |
| <b>Prerequisites</b>                        | Abschluss der Basismodule                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |     |                     |                                   |
| <b>Skills to be acquired in this module</b> | <p>[nop] ++ biological knowledge ++ knowledge of biological working methods ++ biologically relevant knowledge in the natural sciences and mathematics + statistics &amp; scientific programming + interdisciplinary knowledge &amp; 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[/nop]</p> <p>Objective of the module/skills:</p> <p>On completion of this modul 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.</p> |     |                     |                                   |
| <b>Module contents</b>                      | <p>Content of the module:</p> <p>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.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |     |                     |                                   |
| <b>Literaturempfehlungen</b>                | Will be announced in Stud.IP.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |     |                     |                                   |
| <b>Links</b>                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |     |                     |                                   |
| <b>Language of instruction</b>              | German                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |     |                     |                                   |
| <b>Duration (semesters)</b>                 | 1 Semester                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |     |                     |                                   |
| <b>Module frequency</b>                     | annually                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |     |                     |                                   |
| <b>Module capacity</b>                      | 14 (<br>For more applicants than places, a letter of motivation decides on the admission.<br>)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |     |                     |                                   |
| <b>Reference text</b>                       | Takes place alternately with Bio472 Marinbiological Course I. (Change between focus on rocky shore / mud flat & sand flat)<br>If there are more applicants than places available, a letter of motivation decides on the acceptance.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |     |                     |                                   |
| Examination                                 | Prüfungszeiten                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |     | Type of examination |                                   |
| <b>Final exam of module</b>                 | Modulende                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |     | 1 portfolio         |                                   |
| Lehrveranstaltungsform                      | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | SWS | Frequency           | Workload of compulsory attendance |
| Seminar                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 2   | SoSe                | 28                                |
| Exercises                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 2   | SoSe                | 28                                |
| Study trip                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 2   | SoSe                | 28                                |
| <b>Präsenzzeit Modul insgesamt</b>          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |     |                     | 84 h                              |

## bio480 - Functional Morphology of Plants

|                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |     |                                                                       |                                   |
|---------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----------------------------------------------------------------------|-----------------------------------|
| <b>Module label</b>                         | Functional Morphology of Plants                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |     |                                                                       |                                   |
| <b>Modulkürzel</b>                          | bio480                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |     |                                                                       |                                   |
| <b>Credit points</b>                        | 6.0 KP                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |     |                                                                       |                                   |
| <b>Workload</b>                             | 180 h                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |     |                                                                       |                                   |
| <b>Verwendbarkeit des Moduls</b>            | <ul style="list-style-type: none"> <li>• Bachelor's Programme Biology (Bachelor) &gt; Akzentsetzungsmodule</li> <li>• Dual-Subject Bachelor's Programme Biology (Bachelor) &gt; Akzentsetzungsmodule</li> <li>• Master of Education Programme (Gymnasium) Biology (Master of Education) &gt; Mastermodule</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |     |                                                                       |                                   |
| <b>Zuständige Personen</b>                  | <ul style="list-style-type: none"> <li>• Zotz, Gerhard (module responsibility)</li> <li>• Einzmann, Helena (Module counselling)</li> <li>• Zotz, Gerhard (Prüfungsberechtigt)</li> <li>• Einzmann, Helena (Prüfungsberechtigt)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |     |                                                                       |                                   |
| <b>Prerequisites</b>                        | Abschluss der Basismodule                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |     |                                                                       |                                   |
| <b>Skills to be acquired in this module</b> | <p>           ++ biological knowledge<br/>           + knowledge of biological working methods<br/>           + biologically relevant knowledge in the natural sciences and mathematics<br/>           + interdisciplinary knowledge &amp; thinking<br/>           + abstract, logical, analytical thinking<br/>           ++ deepened expertise in biological specialist field<br/>           + independent learning and (research-based) working         </p> <p>           Students acquire knowledge in macroscopic and microscopic morphology of plants, always putting form in the context of function<br/>           Students understand the concepts of allometry and scaling<br/>           Students put this knowledge in the context of theoretical concepts of ecology and evolution<br/>           Students learn experimental techniques in diverse topics, e.g. biomechanics or water relations         </p> |     |                                                                       |                                   |
| <b>Module contents</b>                      | <p>           V: Functional Morphology of Plants (1 SWS)<br/>           E: Mikroskopie, biomechanical Experiments, Form/Function Experiments regarding water uptake, storage and loss (2 SWS)<br/>           S new studies in the field of functional morphology (1 SWS)         </p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |     |                                                                       |                                   |
| <b>Literatureempfehlungen</b>               | <p>           Kadereit JW, et al (2014) Strasburger Lehrbuch der Botanik. 37. Aufl. Spektrum Akademischer Verlag<br/>           Eschrich, W. (1995) Funktionelle Pflanzenanatomie. Springer         </p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |     |                                                                       |                                   |
| <b>Links</b>                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |     |                                                                       |                                   |
| <b>Language of instruction</b>              | German                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |     |                                                                       |                                   |
| <b>Duration (semesters)</b>                 | 1 Semester                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |     |                                                                       |                                   |
| <b>Module frequency</b>                     | annually                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |     |                                                                       |                                   |
| <b>Module capacity</b>                      | 8                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |     |                                                                       |                                   |
| Examination                                 | Prüfungszeiten                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |     | Type of examination                                                   |                                   |
| <b>Final exam of module</b>                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |     | 1 Portfolio (oral presentation and 1 report) OR 1 Written examination |                                   |
| Lehrveranstaltungsform                      | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | SWS | Frequency                                                             | Workload of compulsory attendance |
| Lecture                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 1   | WiSe                                                                  | 14                                |
| Seminar                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 1   | WiSe                                                                  | 14                                |
| Exercises                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 2   | WiSe                                                                  | 28                                |
| <b>Präsenzzeit Modul insgesamt</b>          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |     |                                                                       | 56 h                              |

# Abschlussmodul

## bam - Bachelor's Thesis Module

|                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                     |
|--------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|
| Module label                         | Bachelor´s Thesis Module                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                     |
| Modulkürzel                          | bam                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                     |
| Credit points                        | 15.0 KP                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                     |
| Workload                             | 450 h                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                     |
| Verwendbarkeit des Moduls            | <ul style="list-style-type: none"><li>Bachelor's Programme Biology (Bachelor) &gt; Abschlussmodul</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                     |
| Zuständige Personen                  | <ul style="list-style-type: none"><li>der Biologie, Lehrende (Prüfungsberechtigt)</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                     |
| Prerequisites                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                     |
| Skills to be acquired in this module | <p>Successful completion of the Bachelor module demonstrates that students are able to work on a problem in the field of Biology within a fixed period applying scientific methods.</p> <p>++ biological knowledge<br/>++ knowledge of biological working methods<br/>+ statistics &amp; scientific programming<br/>+ abstract, logical, analytical thinking<br/>++ deepened expertise in biological specialist field<br/>++ independent learning and (research-based) working<br/>++ data presentation and evidence-based discussion (written and spoken)<br/>+ (scientific) communication skills<br/>++ project and time management</p> |                     |
| Module contents                      | <p>Preparing the Bachelor thesis<br/>Active participation in the seminar of the research group, in which the Bachelor's thesis is written</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                     |
| Literatureempfehlungen               | <p>Supervisors may supply an initial reading list with important literature. The students are expected to find and use further literature as needed.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                     |
| Links                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                     |
| Languages of instruction             | German, English                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                     |
| Duration (semesters)                 | 1 Semester                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                     |
| Module frequency                     | halbjährlich                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                     |
| Module capacity                      | unlimited                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                     |
| Examination                          | Prüfungszeiten                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Type of examination |
| Final exam of module                 | Bachelor's thesis (12 CP) and accompanying seminar (3 CP)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                     |
| Lehrveranstaltungsform               | Seminar                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                     |
| SWS                                  | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                     |
| Frequency                            | --                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                     |

