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**Modulhandbuch**  
**Biology - Bachelor's Programme**  
im Summer semester 2024  
erstellt am 23/05/24

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<b>bio215 - Introduction to Biology</b>	5
<b>bio223 - Introductory Botany (Plant Anatomy and Histology)</b>	7
<b>bio220 - Introductory Zoology-Botany</b>	9
<b>bio224 - Introductory Zoology (Animal Morphology and Evolution)</b>	11
<b>bio225 - Basics in Biochemistry, Cell Biology and Genetics</b>	13
<b>bio233 - Basics in Microbiology and Genetics</b>	15
<b>bio236 - Basics in Biochemistry and Cell Biology</b>	16
<b>bio245 - Flora and Fauna</b>	17
<b>bio237 - Basics in Microbiology</b>	19
<b>bio295 - Genetics</b>	21
<b>bio265 - General Microbiology</b>	22
<b>bio275 - Basics in Physiology</b>	23
<b>bio255 - Fundamentals of Molecular Ecology</b>	25
<b>bio256 - Form and Identification - Flora and Fauna</b>	26
<b>phy910 - Physics for Students of Biology and Dual Subject Chemistry</b>	28
<b>bio150 - Statistics for Biologists</b>	29
<b>bio251 - Exercises in Biochemistry and Molecular Biology</b>	30
<b>che101 - Basic Chemistry</b>	31
<b>che102 - Basic Chemistry Laboratory</b>	32
<b>mat980 - Mathematics for the Life Sciences</b>	33
<b>che190 - Basic Organic Chemistry</b>	34

---

<b>che290 - Experimental Organic Chemistry</b>	36
<b>bio300 - Evolutionary Biology</b>	37
<b>bio310 - General Ecology</b>	39
<b>bio325 - Pollination and Dispersal - Concepts</b>	41
<b>bio326 - Pollination and Dispersal - Methods</b>	42
<b>bio327 - Pollination and Dispersal - Methods not just for Schools</b>	43
<b>bio330 - Marine Ecology</b>	44
<b>bio340 - Morphology, Phylogeny, and Evolution of Metazoa</b>	46
<b>bio355 - Microscopical Anatomy</b>	47
<b>bio360 - Marine Biodiversity</b>	49
<b>bio375 - Flora - Advanced Concepts</b>	51
<b>bio376 - Flora - Advanced Methods</b>	52
<b>bio377 - Flora - Advanced Methods not just for schools</b>	53
<b>bio385 - Specific Microbiology</b>	54
<b>bio405 - Introduction to Neurobiology I</b>	55
<b>bio408 - Introduction to Neurobiology I</b>	56
<b>bio417 - Introduction to Systems Neurobiology - Theory and Practice</b>	57
<b>bio415 - Introduction to Neurobiology II</b>	58
<b>bio420 - Biochemistry of the Cell</b>	59
<b>bio430 - Analytical Biochemistry</b>	60
<b>bio440 - Microfauna, Mircoflora &amp; Protista of limnic and marine habitats</b>	61
<b>bio450 - Posters, Pictures, Presentations and Papers</b>	63

---

<b>bio470 - Marine Biology Field Trip</b>	
.....	64
<b>bio472 - Marine Biology Field Trip</b>	
.....	65
<b>bio473 - Evolutionsgeschichte des Lebens: Leben im Wandel der Erdzeitalter</b>	
.....	66
<b>bio480 - Functional Morphology of Plants</b>	
.....	68
<b>bam - Bachelor's Thesis Module</b>	
.....	69

## Basismodule

### bio215 - Introduction to Biology

<b>Module label</b>	Introduction to Biology		
<b>Modulkürzel</b>	bio215		
<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; Basismodule</li> <li>• Bachelor's Programme Mathematics (Bachelor) &gt; Nebenfachmodule</li> <li>• Dual-Subject Bachelor's Programme Biology (Bachelor) &gt; Basismodule</li> </ul>		
<b>Zuständige Personen</b>	<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>		
<b>Prerequisites</b>			
<b>Skills to be acquired in this module</b>	<p>++ biological knowledge                  ++ biologically relevant knowledge in the natural sciences and mathematics                  ++ interdisciplinary knowledge &amp; thinking                  ++ abstract, logical, analytical thinking</p> <p>Qualifications that the module provides</p> <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>		
<b>Module contents</b>	Lecture conveys knowledge in - evolution, ecology and biodiversity (WiSe) - animal physiology and developmental biology (SoSe)		
<b>Literatureempfehlungen</b>	Campbell et al. "Biologie", Pearson Sadava et al. "Purves, Biologie", 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>	300		
<b>Examination</b>	<b>Prüfungszeiten</b>	<b>Type of examination</b>	
<b>Final exam of module</b>	lecture-free periods after each series	2 written examinations (WiSe and SoSe)	
<b>Lehrveranstaltungsform</b>	<b>Comment</b>	<b>SWS</b>	<b>Frequency</b> <b>Workload of compulsory attendance</b>
Lecture		12	SoSe und WiSe      168
Seminar (Gefahrstoffverordnung und Arbeitsschutz (PFLICHT für Erstsemester!))			WiSe      0
Tutorial (optional)			--      0
<b>Präsenzzeit Modul insgesamt</b>			<b>168 h</b>



## bio223 - Introductory Botany (Plant Anatomy and Histology)

<b>Module label</b>	Introductory Botany (Plant Anatomy and Histology)	
<b>Modulkürzel</b>	bio223	
<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>• Will, Maria (module responsibility)</li> <li>• Zotz, Gerhard (Module counselling)</li> <li>• Will, Maria (Prüfungsberechtigt)</li> <li>• Plewka, Isabelle (Prüfungsberechtigt)</li> </ul>	
<b>Prerequisites</b>	keine	
<b>Skills to be acquired in this module</b>	<p>++ biological knowledge + knowledge of biological working methods ++  biologically relevant knowledge in the natural sciences and mathematics +  abstract, logical, analytical thinking + independent learning and (research-  based) working + teamwork</p> <p>THEORY: * To understand the fundamentals of reconstructing phylogenetic  relationships * To know the cell structures, organization, and reproduction of  plants * To know the morphology and anatomy of individual species</p> <p>PRACTICE: * To improve and verify the theoretical knowledge acquired from  lectures and textbooks by studying the original * To train visual and tactile  perception by studying various species * To learn that representations in  textbooks are abstractions of a much more complex reality * To be able to  criticize representations in textbooks and models * To acquire the knowledge of  the function in living plants by studying preserved specimens * Learning how to  follow preparation instructions * Learning that the organization of individual  species may be highly variable * Preparing records or drawings from the  information obtained by original specimens studied</p>	
<b>Module contents</b>	<p>Light microscopic methods are applied to study structures in plants. Records  in the form of descriptions and drawings. 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>	
<b>Literatureempfehlungen</b>	<p>Springer, 2008, UTB; Grundlagen der Botanik, UTB; Lüttge, Kluge, Bauer,  Botanik, WILEY-VCH, 2010</p> <p>Campbell: Biologie (Spektrum Verlag), neueste Ausgabe oder Purves: Biologie  (Spektrum Verlag), neueste Ausgabe</p> <p>BOTANIK: Skript; Kück, Wolff Botanisches Grundpraktikum, 2. Auflage,  Springer, 2008, UTB; Grundlagen der Botanik, UTB; Lüttge, Kluge, Bauer,  Botanik, WILEY-VCH, 2010</p>	
<b>Links</b>		
<b>Language of instruction</b>	German	
<b>Duration (semesters)</b>	1 Semester	
<b>Module frequency</b>	Wintersemester	
<b>Module capacity</b>	unlimited	
<b>Reference text</b>	<p>Modul für Studierende <b>mit Studienbeginn ab dem WiSe 23/24</b>. Studierende  mit Studienbeginn vor dem WiSe 23/24 studieren das Modul bio220.  (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).</p>	
<b>Type of module</b>	Pflicht / Mandatory	
<b>Module level</b>	BC (Basiscurriculum / Base curriculum)	
<b>Teaching/Learning method</b>	lecture, exercise, seminar	
<b>Examination</b>	Prüfungszeiten	Type of examination
<b>Final exam of module</b>	Written examination in the final week	1 written examination; voluntary bonus (10%) 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	WiSe	14
Seminar		1	WiSe	14
Exercises		2	WiSe	28
Tutorial (optional)			WiSe	0
<b>Präsenzzeit Modul insgesamt</b>				<b>56 h</b>



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## bio220 - Introductory Zoology-Botany

<b>Module label</b>	Introductory Zoology-Botany
<b>Modulkürzel</b>	bio220
<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; 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>• 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>
<b>Prerequisites</b>	keine
<b>Skills to be acquired in this module</b>	<p>++ biological knowledge + knowledge of biological working methods ++ biologically relevant knowledge in the natural sciences and mathematics + abstract, logical, analytical thinking + independent learning and (research-based) working + teamwork</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>
<b>Module contents</b>	<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>
<b>Literatureempfehlungen</b>	<p>GENERAL:: Campbell: Biologie (Spektrum Verlag) or Purves: Biologie (Spektrum Verlag), latest edition</p> <p>ZOOLOGY: V. Storch: Kükenthal 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

<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>	Modul für Studierende <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). Studierende mit Studienbeginn ab dem WiSe 23/24 studieren die Module bio223 und bio224.

Examination	Prüfungszeiten	Type of examination
<b>Final exam of module</b>	Written examination in the final week of the current part	1 written examination (50%) following the part Zoology 1 written examination (50%) following the part Botany;  voluntary bonus (10%) in the second part (botany)  <b>PLEASE NOTE:</b> 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
<b>Präsenzzeit Modul insgesamt</b>				<b>84 h</b>

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## bio224 - Introductory Zoology (Animal Morphology and Evolution)

<b>Module label</b>	Introductory Zoology (Animal Morphology and Evolution)
<b>Modulkürzel</b>	bio224
<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>• Ahlrichs, Wilko (module responsibility)</li><li>• Ahlrichs, Wilko (Module counselling)</li><li>• Käfer, Simon (Module counselling)</li><li>• Ahlrichs, Wilko (Prüfungsberechtigt)</li></ul>
<b>Prerequisites</b>	
<b>Skills to be acquired in this module</b>	<p>++ biologische Fachkenntnisse + Kenntnisse biologischer Arbeitstechniken ++grundlegende Kenntnisse zum Aufbau und Umgang mit dem Mikroskop (Köhlern) ++grundlegende Kenntnisse zur menschlichen Wahrnehmung von Gestalt ++ grundlegende Kenntnisse zum wissenschaftlichen Zeichnen und Illustration ++ biologierelevante naturwissenschaftliche/mathematische Grundkenntnisse + Abstraktes, logisches, analytisches Denken + Selbstständiges Lernen und (forschendes) Arbeiten + Teamfähigkeit</p> <p>THEORIE: - Grundlagen der Methoden der Rekonstruktion der phylogenetischen Systematik verstehen - Die Stellung der wichtigsten Tiergruppen im Phylogenetischen System der Tiere kennen. Grundmuster, insbesondere Autapomorphien von ranghohen Stammarten kennen.</p> <p>Morphologie, Funktion und Evolution tierischer Zellstrukturen, Organe und Organsysteme (Epidermis, Muskelsysteme, Leibeshöhlenverhältnisse, Kreislaufsysteme, Exkretionssysteme, Nerven- und Sinnessysteme, Verdauungssysteme, Reproduktionssysteme; weiterhin Atmung, Ernährung, Fortpflanzung und Entwicklung kennen. Morphologie und Ökologie ausgesuchter Tierarten kennen.</p> <p>PRAXIS: - theoretischen Kenntnisse aus Vorlesungen und Lehrbuch am Original vertiefen und überprüfen - visuelle und taktile Wahrnehmung an unterschiedlichen Arten schulen - erfahren, dass Lehrbuchdarstellungen Abstraktionen einer sehr viel komplexeren Wirklichkeit sind - in die Lage versetzt werden, Lehrbuchdarstellungen und Modelle zu kritisieren - am Präparat die Kenntnisse erwerben, die für das Verständnis der Funktion am lebenden Tier erforderlich sind - lernen, mit Präparieranleitungen zu arbeiten - lernen, dass der Bau einzelner Arten sehr variabel sein kann - sich üben in der Umsetzung des am Original Gesehenen in ein Protokoll, z.B. eine Zeichnung - einen verantwortungsvollen Umgang mit Tieren lernen - handwerkliches Geschick in der Präparation von Tieren erlernen.</p>
<b>Module contents</b>	<p>ALLGEMEIN: Methode der phylogenetischen Systematik, Hierarchischer Aufbau des Lebens.</p> <p>Lichtmikroskop und lichtmikroskopische Methoden zur Untersuchung tierischer Strukturen. Protokolle in der Form von Beschreibungen und Zeichnungen.</p> <p>SPEZIELL: Phylogenie der Tiere (Metazoa) und Teilen der Protisten. Die phylogenetische Stellung der behandelten Taxa im System der Tiere. Grundmuster der ranghohen Stammarten der Tiere und insbesondere deren Autapomorphien. Die Evolution wichtiger Zelltypen und die Evolution der Organsysteme, insbesondere Habitus mit Gliederung, Extremitäten und Anhänge, Epidermis, Muskelsysteme, Leibeshöhlen und Kreislaufsysteme, Exkretionssysteme, Nerven- und Sinnessysteme, Verdauungssysteme, Reproduktionssysteme; weiterhin Fortpflanzung und Entwicklung, Nahrungsbeschaffung, Nahrungsaufnahme und Verdauung. Die Morphologie und Ökologie ausgewählter Arten.</p>
<b>Literaturempfehlungen</b>	wird im Modul bekannt gegeben
<b>Links</b>	

<b>Language of instruction</b>	German			
<b>Duration (semesters)</b>	1 Semester			
<b>Module frequency</b>	Wintersemester			
<b>Module capacity</b>	150			
<b>Reference text</b>	Modul für Studierende <b>mit Studienbeginn ab dem WiSe 23/24</b> . Studierende mit Studienbeginn vor dem WiSe 23/24 studieren das Modul bio220. (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).			
<b>Examination</b>	<b>Prüfungszeiten</b>	<b>Type of examination</b>		
<b>Final exam of module</b>	Wintersemester	1 Prüfungsleistung: 1 Klausur		
<b>Lehrveranstaltungsform</b>	<b>Comment</b>	<b>SWS</b>	<b>Frequency</b>	<b>Workload of compulsory attendance</b>
Lecture		1	WiSe	14
Seminar		1	WiSe	14
Exercises		2	WiSe	28
Tutorial (optional)			WiSe	0
<b>Präsenzzeit Modul insgesamt</b>				<b>56 h</b>

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## bio225 - Basics in Biochemistry, Cell Biology and Genetics

<b>Module label</b>	Basics in Biochemistry, Cell Biology and Genetics
<b>Modulkürzel</b>	bio225
<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; 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>• Koch, Karl-Wilhelm (module responsibility)</li><li>• Claußen, Maike (Module counselling)</li><li>• Winklhofer, Michael (Module counselling)</li><li>• Claußen, Maike (Prüfungsberechtigt)</li><li>• Koch, Karl-Wilhelm (Prüfungsberechtigt)</li><li>• Winklhofer, Michael (Prüfungsberechtigt)</li></ul>
<b>Prerequisites</b>	
<b>Skills to be acquired in this module</b>	<ul style="list-style-type: none"><li>++ biological knowledge</li><li>+ knowledge of biological working methods</li><li>++ biologically relevant knowledge in the natural sciences and mathematics</li><li>+ abstract, logical, analytical thinking</li><li>+ deepened expertise in biological specialist field</li><li>+ independent learning and (research-based) working</li></ul>
<b>Module contents</b>	<p>Overview of structure, function and biosynthesis of the major classes of substances and metabolic processes, structure and function of carbohydrates, proteins and nucleic acids; biological membranes and transmembrane transport; cell structure, structure and function of organelles, protein synthesis and post-translational modification; intracellular transport processes, messenger substances and cellular communication, cell division and controlled cell death. Introduction in pathogens, cell biology of bacterial and viral infection, innate and acquired immune system.</p> <ul style="list-style-type: none"><li>• Molecular basis of genetics</li><li>• DNA replication</li><li>• Cell division Mitosis and meiosis</li><li>• Transcription</li><li>• The genetic code</li><li>• Translation</li><li>• Regulation of gene expression</li><li>• Mutation and DNA repair</li><li>• Mendelian genetics and formal genetics</li><li>• Analysis of pedigrees</li><li>• Sex chromosome-linked inheritance</li><li>• Genome organization</li></ul>
<b>Literatureempfehlungen</b>	<p>Allgemeine Lehrbücher der Biochemie, z. B.: Biochemie, Müller-Esterl Biochemie, Lubert Stryer Lehninger Prinzipien der Biochemie, David L. Nelson und Michael M. Cox Principles of Biochemistry, Horton et al. Zellbiologie: Zellbiologie, Helmut Plattner und Joachim Hentschel Molekulare Zellbiologie, Gerald Karp Molekularbiologie der Zelle, Bruce Alberts</p> <p>Purves Biologie, Springer Verlag, neueste Auflage; Campbell Biologie, Person Verlag neueste Auflage; Molekulare Genetik, Thieme Verlag, neueste Auflage</p> <p>Molekularbiologie der Zelle, Wiley/VCH, neueste Auflage</p>
<b>Links</b>	
<b>Language of instruction</b>	German

<b>Duration (semesters)</b>	2 Semester			
<b>Module frequency</b>	WiSe und SoSe			
<b>Module capacity</b>	unlimited ()			
Examination	Prüfungszeiten	Type of examination		
<b>Final exam of module</b>	End of winter semester: written exam in biochemistry and cell biology, end of summer semester: written exam in genetics, follow-up exams at the beginning of the following semesters.	2 examinations: 1 written exam in biochemistry and cell biology (2/3*100%) 1 written exam on genetics (1/3*100%)		
<b>Lehrveranstaltungsform</b>	<b>Comment</b>	<b>SWS</b>	<b>Frequency</b>	<b>Workload of compulsory attendance</b>
Lecture	Der Teil Biochemie und Zellbiologie wird im Wintersemester und der Teil Genetik in der zweiten Hälfte des Sommersemesters angeboten.	4	SoSe und WiSe	56
Exercises		2	SoSe oder WiSe	28
<b>Präsenzzeit Modul insgesamt</b>				<b>84 h</b>

## 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 + knowledge of biological working methods + biologically relevant knowledge in the natural sciences and mathematics + deepened expertise in biological specialist field + independent learning and (research-based) working			
<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> . (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

<b>Module label</b>	Basics in Biochemistry and Cell Biology	
<b>Modulkürzel</b>	bio236	
<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>• Koch, Karl-Wilhelm (module responsibility)</li> <li>• Winklhofer, Michael (Module counselling)</li> <li>• Koch, Karl-Wilhelm (Prüfungsberechtigt)</li> <li>• Winklhofer, Michael (Prüfungsberechtigt)</li> </ul>	
<b>Prerequisites</b>		
<b>Skills to be acquired in this module</b>	++ biological knowledge + knowledge of biological working methods ++ biologically relevant knowledge in the natural sciences and mathematics + abstract, logical, analytical thinking	
<b>Module contents</b>	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	
<b>Literatureempfehlungen</b>	Biochemie, Müller-Esterl Stryer Biochemie, Berg, Tymoczko, Stryer Lehninger Prinzipien der Biochemie, David L. Nelson und Michael M. Cox Principles of Biochemistry, Horton et al. Zellbiologie, Helmut Plattner und Joachim Hentschel Molekulare Zellbiologie, Gerald Karp Molekularbiologie der Zelle, Bruce Alberts	
<b>Links</b>		
<b>Language of instruction</b>	German	
<b>Duration (semesters)</b>	1 Semester	
<b>Module frequency</b>	Wintersemester	
<b>Module capacity</b>	unlimited	
<b>Reference text</b>	Modul für Studierende <b>mit Studienbeginn vor dem WiSe 23/24</b> . (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.	
<b>Examination</b>	Prüfungszeiten	Type of examination
<b>Final exam of module</b>	during the semester	written exam
<b>Lehrveranstaltungsform</b>	Lecture	
<b>SWS</b>	4	
<b>Frequency</b>	WiSe	
<b>Workload Präsenzzeit</b>	56 h	



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# Aufbaumodule

## bio245 - Flora and Fauna

<b>Module label</b>	Flora and Fauna
<b>Modulkürzel</b>	bio245
<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; Mastermodule</li></ul>
<b>Zuständige Personen</b>	<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>
<b>Prerequisites</b>	
<b>Skills to be acquired in this module</b>	+ biological knowledge + knowledge of biological working methods + independent learning and (research-based) working + knowledge of safety and environmental issues To determine species-rich taxa and to verify the results independently using relevant literature
<b>Module contents</b>	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.
<b>Literaturempfehlungen</b>	Botany: Rothmaler - Exkursionsflora von Deutschland, Band 2 - Grundband, Spektrum Akademischer Verlag Zoology: M. Schaefer: Brohmer - Fauna von Deutschland, from 20th edition
<b>Links</b>	
<b>Language of instruction</b>	German
<b>Duration (semesters)</b>	1 oder 2 Semester
<b>Module frequency</b>	jährlich
<b>Module capacity</b>	unlimited (
	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.
	)
<b>Reference text</b>	Modul für - Studierende des <b>Fachbachelors mit Studienbeginn ab dem WiSe 23/24</b> sowie für - <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		
<b>Final exam of module</b>	Botany: Written examination before the end of the lecture Zoology: Written examination before the end of the lecture	1 written examination (Botany 50 %) 1 written examination (Zoology 50 %) ungraded minutes PLEASE NOTE: Additional conditions regarding attendance and ungraded activities as determined by the persons responsible for the module will apply.		
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>

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## bio237 - Basics in Microbiology

<b>Module label</b>	Basics in Microbiology
<b>Modulkürzel</b>	bio237
<b>Credit points</b>	3.0 KP
<b>Workload</b>	90 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>• 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>• Rabus, Ralf Andreas (Prüfungsberechtigt)</li></ul>
<b>Prerequisites</b>	
<b>Skills to be acquired in this module</b>	<p>++ biological knowledge</p> <p>++ knowledge of biological working methods</p> <p>++ biologically relevant knowledge in the natural sciences and mathematics</p> <p>+ deepened expertise in biological specialist field</p> <p>+ independent learning and (research-based) working</p> <p>The students acquire microbiological expertise</p>
<b>Module contents</b>	<p>introduction:</p> <p>History, principle of smallness, importance</p> <p>Fungi:</p> <p>Growth, forms of reproduction, life cycles, phytopathogens, mycorrhiza, lichens.</p> <p>Viruses:</p> <p>Technical handling, development, lytic/lysogenic cycle, structure, classification, examples.</p> <p>Prokaryotic cell:</p> <p>Microscopy, cell wall of Gram positive/negative bacteria, cytoplasmic membrane, cytoskeleton, compartments, storage substances, flagella, fimbriae, pili, cellulosome, endospores, heterocysts.</p> <p>Metabolism:</p> <p>Central metabolic pathways, degradation of organic compounds, oxidation of inorganic compounds (chemolithotrophy), microbial fermentations, anaerobic respiration, phototrophic lifestyle.</p> <p>Diversity, evolution and systematics:</p> <p>Diversity concept, components of systematics, evolutionary mechanisms, Archaea, deep branching Bacteria, Firmicutes, Actinobacteria, Cyanobacteria, Spirochaetae, PVC superphylum, Proteobacteria (alpha, beta, gamma, delta and epsilon), et al.</p>
<b>Literaturempfehlungen</b>	Fuchs, Allgemeine Mikrobiologie, Thieme Verlag
<b>Links</b>	
<b>Language of instruction</b>	German
<b>Duration (semesters)</b>	1. Sommersemesterhälfte Semester
<b>Module frequency</b>	jährlich
<b>Module capacity</b>	unlimited

<b>Type of module</b>		Pflicht / Mandatory		
<b>Module level</b>		AC (Aufbaucurriculum / Composition)		
Examination	Prüfungszeiten	Type of examination		
<b>Final exam of module</b>	im Anschluss an den Veranstaltungsteil		written exam	
Lehrveranstaltungsform	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		2	SoSe	0
Exercises			SoSe oder WiSe	0
<b>Präsenzzeit Modul insgesamt</b>				0 h

## 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> </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            ++ knowledge of biological working methods            + biologically relevant knowledge in the natural sciences and mathematics            + abstract, logical, analytical thinking            ++ deepened expertise in biological specialist field            ++ independent learning and (research-based) working            ++ data presentation and evidence-based discussion (written and spoken)            + teamwork            ++ (scientific) communication skills            + project and time management            + knowledge of safety and environmental issues         </p> <p>Fundamentals of genetics, performing experiments, quantitative analyses.</p>			
<b>Module contents</b>	<p>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</p>			
<b>Literatureempfehlungen</b>	<p>Campbell/Reece Biologie (latest edition, Pearson Verlag), Strachan &amp; Read Molekulare Humangenetik (latest edition, Spektrum Verlag); Purves Biologie (latest editdion, Spektrum Verlag).</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>	72			
<b>Examination</b>	<b>Prüfungszeiten</b>	<b>Type of examination</b>		
<b>Final exam of module</b>		Written examination (100%), ungraded presentation, protocol		
<b>Lehrveranstaltungsform</b>	<b>Comment</b>	<b>SWS</b>	<b>Frequency</b>	<b>Workload of compulsory attendance</b>
Lecture		1.5	WiSe	21
Exercises		3	WiSe	42
Seminar		1.5	WiSe	21
<b>Präsenzzeit Modul insgesamt</b>				<b>84 h</b>

## bio265 - General Microbiology

<b>Module label</b>	General Microbiology		
<b>Modulkürzel</b>	bio265		
<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 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		
<b>Examination</b>	<b>Prüfungszeiten</b>	<b>Type of examination</b>	
<b>Final exam of module</b>		1 written examination	
		PLEASE NOTE: 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
Seminar		1	14
Practical training		4	56
<b>Präsenzzeit Modul insgesamt</b>			<b>98 h</b>

## 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          ++ knowledge of biological working methods          + biologically relevant knowledge in the natural sciences and mathematics          + statistics &amp; scientific programming          ++ abstract, logical, analytical thinking          + deepened expertise in biological specialist field          ++ independent learning and (research-based) working          + 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          Schmidt, Lang, Heckmann: Physiologie des Menschen mit Pathophysiologie, Aufl. 31, 2011          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%)          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          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>

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## 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            ++ 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</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		
<b>Examination</b>	<b>Prüfungszeiten</b>	<b>Type of examination</b>	
<b>Final exam of module</b>	exam		
<b>Lehrveranstaltungsform</b>	<b>Comment</b>	<b>SWS</b>	<b>Frequency</b>
			<b>Workload of compulsory attendance</b>
Lecture		1.5	21
Exercises		4.5	63
<b>Präsenzzeit Modul insgesamt</b>			<b>84 h</b>

## bio256 - Form and Identification - Flora and Fauna

<b>Module label</b>	Form and Identification - Flora and Fauna	
<b>Modulkürzel</b>	bio256	
<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; Aufbaumodule</li> </ul>	
<b>Zuständige Personen</b>	<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>	
<b>Prerequisites</b>		
<b>Skills to be acquired in this module</b>	<ul style="list-style-type: none"> <li>+ biological knowledge</li> <li>+ knowledge of biological working methods</li> <li>+ independent learning and (research-based) working</li> <li>+ knowledge of safety and environmental issues</li> </ul> <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>	
<b>Module contents</b>	<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            EXE: Working with identification keys for plants and animals and their classification            EXC: Excursion to characteristic habitats of Northwestern Germany, practicing work with field guides and identification of important traits</p>	
<b>Literaturempfehlungen</b>	<p>Botany:            Rothmaler - Exkursionsflora von Deutschland, Band 2 - Grundband, Spektrum Akademischer Verlag            Zoology:            M. Schaefer: Brohmer - Fauna von Deutschland, ab 20. Auflage            B. Klausnitzer: Stresemann - Exkursionsfauna von Deutschland. Band 1: Wirbellose (ohne Insekten)</p>	
<b>Links</b>		
<b>Language of instruction</b>	German	
<b>Duration (semesters)</b>	1 oder 2 Semester	
<b>Module frequency</b>	jährlich	
<b>Module capacity</b>	unlimited ( 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. )	
<b>Reference text</b>	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.	
<b>Examination</b>	<b>Prüfungszeiten</b>	<b>Type of examination</b>
<b>Final exam of module</b>	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>	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			
<b>Module contents</b>	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.			
<b>Literaturempfehlungen</b>	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			
<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>			<b>56 h</b>

## 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 ++ knowledge of biological working methods + biologically relevant knowledge in the natural sciences and mathematics + abstract, logical, analytical thinking + data presentation and evidence-based discussion (written and spoken) + teamwork + knowledge of safety and environmental issues		
<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		
<b>Examination</b>	<b>Prüfungszeiten</b>	<b>Type of examination</b>	
<b>Final exam of module</b>	during semester	written exam; additionally ungraded protocols	
<b>Lehrveranstaltungsform</b>	<b>Comment</b>	<b>SWS</b>	<b>Frequency</b>
			<b>Workload of compulsory attendance</b>
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		
<b>Examination</b>	<b>Prüfungszeiten</b>	<b>Type of examination</b>	
<b>Final exam of module</b>	Klausur am Beginn der vorlesungsfreien Zeit (normalerweise Anfang Februar)	written exam (100%)	
<b>Lehrveranstaltungsform</b>	<b>Comment</b>	<b>SWS</b>	<b>Frequency</b>
Lecture		3	WiSe
Exercises		1	WiSe
<b>Präsenzzeit Modul insgesamt</b>			<b>Workload of compulsory attendance</b>
			56 h

## che102 - Basic Chemistry Laboratory

<b>Module label</b>	Basic Chemistry Laboratory			
<b>Modulkürzel</b>	che102			
<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>• Koch, Rainer (module responsibility)</li> <li>• Koch, Rainer (Prüfungsberechtigt)</li> </ul>			
<b>Prerequisites</b>	bestandene Modulprüfung che101 (Nachweis chemischer Grundkenntnisse für Laborsicherheit)			
<b>Skills to be acquired in this module</b>	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.			
<b>Module contents</b>	VL: Theoretische Grundlagen der im Praktikum durchgeführten Versuche PR: Einführung in die Laborpraxis: Erlernen wichtiger Standardprozeduren im chemischen Labor.			
<b>Literaturempfehlungen</b>	Lehrbücher der allgemeinen und anorganischen Chemie, z.B. Riedel, Anorganische Chemie, de Gruyter; Holleman-Wiberg, Lehrbuch der Anorganischen Chemie, de Gruyter; Zeeck: Chemie für Mediziner, Urban & Schwarzenberg; Latsche/Katzmaier: Chemie für Biologen, Springer; Praktikumsskript.			
<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 ( Die maximale Teilnehmerzahl ist beim Modulverantwortlichen zu erfragen. )			
<b>Reference text</b>	VL 5.07.714, PR 5.07.713			
Examination	Prüfungszeiten		Type of examination	
<b>Final exam of module</b>			not graded	
Lehrveranstaltungsform	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		1	WiSe	14
Practical training		5	WiSe	70
<b>Präsenzzeit Modul insgesamt</b>				<b>84 h</b>



## 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				
<b>Examination</b>	Prüfungszeiten		Type of examination		
<b>Final exam of module</b>	Vorlesungsende		KL		
<b>Lehrveranstaltungsform</b>	<b>Comment</b>	<b>SWS</b>	<b>Frequency</b>	<b>Workload of compulsory attendance</b>	
Lecture		3		42	
Exercises		1		14	
<b>Präsenzzeit Modul insgesamt</b>					<b>56 h</b>

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## che190 - Basic Organic Chemistry

<b>Module label</b>	Basic Organic Chemistry
<b>Modulkürzel</b>	che190
<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 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; Erweiterungsmodul</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>
<b>Zuständige Personen</b>	<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>
<b>Prerequisites</b>	
<b>Skills to be acquired in this module</b>	<p><b>Kenntnisse</b> Grundlegende Stoffsystematik der Organischen Chemie, Reaktionsweisen organischer Verbindungen, grundlegende Reaktionsmechanismen</p> <p><b>Fertigkeiten</b> 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</p>
<b>Module contents</b>	<ul style="list-style-type: none"><li>• Mit dem Besuch dieses Moduls erwerben die Studierenden das Basiswissen der Organischen Chemie.</li><li>• 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.</li></ul>
<b>Literaturempfehlungen</b>	<ul style="list-style-type: none"><li>• Wird in der Vorlesung bekannt gegeben</li></ul>
<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>	Empfohlene Belegung: 3. Fachsemester (WiSe)

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Examination	Prüfungszeiten	Type of examination
<b>Final exam of module</b>		written exam
	<ul style="list-style-type: none"><li>• In der vorlesungsfreien Zeit entsprechend separater Ankündigung</li></ul>	
<b>Lehrveranstaltungsform</b>	Lecture	
<b>SWS</b>	4	
<b>Frequency</b>	WiSe	
<b>Workload Präsenzzeit</b>	56 h	

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## 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		
<b>Examination</b>	<b>Prüfungszeiten</b>	<b>Type of examination</b>	
<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	
<b>Lehrveranstaltungsform</b>	<b>Comment</b>	<b>SWS</b>	<b>Frequency</b>
Seminar	Blockveranstaltung	3	SoSe
Practical training	Blockveranstaltung	3	SoSe
<b>Präsenzzeit Modul insgesamt</b>			<b>Workload of compulsory attendance</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          + 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</p> <p>Introduction to both microevolution (speciation and species concepts, adaptation and selection, behavioural ecology, reproduction systems) and macroevolution.          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.; Futuyama, 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. Mihalca. 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%) Portfolio (40%)  PLEASE NOTE: 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>
Lecture		2	WiSe
			<b>Workload of compulsory attendance</b>
			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>				<b>140 h</b>

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## bio310 - General Ecology

<b>Module label</b>	General Ecology
<b>Modulkürzel</b>	bio310
<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>• 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>
<b>Prerequisites</b>	Abschluss der Basismodule
<b>Skills to be acquired in this module</b>	<ul style="list-style-type: none"><li>++ biological knowledge</li><li>++ knowledge of biological working methods</li><li>++ biologically relevant knowledge in the natural sciences and mathematics</li><li>+ statistics &amp; scientific programming</li><li>+ interdisciplinary knowledge &amp; thinking</li><li>++ abstract, logical, analytical thinking</li><li>+ deepened expertise in biological specialist field</li><li>+ independent learning and (research-based) working</li><li>+ data presentation and evidence-based discussion (written and spoken)</li><li>+ (scientific) communication skills</li></ul>
<b>Module contents</b>	<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: 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>
<b>Literaturempfehlungen</b>	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. &

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 Praktikumskript  
 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: 1) Prüfung zur Vorlesung (Klausur; 30%) im 1. Semester des Moduls sowie 2) Portfolio zum Praktikum (Portfolio; 70%) im 2. Semester des Moduls Zum Bestehen des Moduls müssen alle Teilleistungen bestanden sein.  Voraussetzung für die Vergabe von Kreditpunkten ist die aktive Teilnahme an: 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>				140 h



## bio325 - Pollination and Dispersal - Concepts

<b>Module label</b>	Pollination and Dispersal - Concepts			
<b>Modulkürzel</b>	bio325			
<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			
<b>Skills to be acquired in this module</b>	<ul style="list-style-type: none"> <li>+ biological knowledge</li> <li>+ knowledge of biological working methods</li> <li>+ abstract, logical, analytical thinking</li> <li>+ deepened expertise in biological specialist field</li> <li>+ independent learning and (research-based) working</li> <li>+ data presentation and evidence-based discussion (written and spoken)</li> <li>+ teamwork</li> <li>+ (scientific) communication skills</li> <li>+ project and time management</li> <li>+ knowledge of safety and environmental issues</li> </ul> <p>Extended knowledge of biodiversity and evolution of plants focusing on reproduction, dispersal, germination and establishment of plants</p>			
<b>Module contents</b>	<p>L: Pollination, dispersal, germination of plants, plant breeding            S: Pollination and dispersal biology of plants in a systematic context</p>			
<b>Literatureempfehlungen</b>	<p>The course does not follow a special textbook. The following German literature is recommended to students interested in the course: Dieter Heß – Die Blüte, Eugen Ulmer Verlag as well as Leins &amp; Erbar -Blüte und Frucht, Schweizerbart'sche Verlagsbuchhandlung.</p>			
<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			
<b>Examination</b>	<b>Prüfungszeiten</b>	<b>Type of examination</b>		
<b>Final exam of module</b>	portfolio			
<b>Lehrveranstaltungsform</b>	<b>Comment</b>	<b>SWS</b>	<b>Frequency</b>	<b>Workload of compulsory attendance</b>
Lecture		2	SoSe	28
Seminar		2	SoSe	28
<b>Präsenzzeit Modul insgesamt</b>				<b>56 h</b>

## 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 bio256 Flora/Fauna	
<b>Skills to be acquired in this module</b>	<ul style="list-style-type: none"> <li>+ biological knowledge</li> <li>+ knowledge of biological working methods</li> <li>+ abstract, logical, analytical thinking</li> <li>+ deepened expertise in biological specialist field</li> <li>+ independent learning and (research-based) working</li> <li>+ data presentation and evidence-based discussion (written and spoken)</li> <li>+ teamwork</li> <li>+ (scientific) communication skills</li> <li>+ project and time management</li> <li>+ knowledge of safety and environmental issues</li> </ul> <p>Extended knowledge of biodiversity and evolution of plants focusing on reproduction, dispersal, germination and establishment of plants</p>	
<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	
<b>Examination</b>	Prüfungszeiten	Type of examination
<b>Final exam of module</b>		Portfolio
<b>Lehrveranstaltungsform</b>	Exercises	
<b>SWS</b>	4	
<b>Frequency</b>	SoSe	
<b>Workload Präsenzzeit</b>	56 h	

## 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 bio256 Flora/fauna	
<b>Skills to be acquired in this module</b>	<p>+ biological knowledge            + knowledge of biological working methods            + abstract, logical, analytical thinking            + deepened expertise in biological specialist field            + independent learning and (research-based) working            + data presentation and evidence-based discussion (written and spoken)            + teamwork            + (scientific) communication skills            + project and time management            + knowledge of safety and environmental issues</p> <p>Extended knowledge of biodiversity and evolution of plants focusing on reproduction, dispersal, germination and establishment of plants</p>	
<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	
<b>Examination</b>	Prüfungszeiten	Type of examination
<b>Final exam of module</b>		portfolio
<b>Lehrveranstaltungsform</b>	Exercises	
<b>SWS</b>	6	
<b>Frequency</b>	SoSe	
<b>Workload Präsenzzeit</b>	84 h	

## bio330 - Marine Ecology

<b>Module label</b>	Marine Ecology		
<b>Modulkürzel</b>	bio330		
<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>• Moorthi, Stefanie (Module counselling)</li> <li>• Hillebrand, Helmut (module responsibility)</li> <li>• Hillebrand, Helmut (Prüfungsberechtigt)</li> <li>• Moorthi, Stefanie (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] 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</p>		
<b>Module contents</b>	<p>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.</p>		
<b>Literatureempfehlungen</b>	C.M. Lalli, T.R. Parsons, Biological Oceanography: An Introduction, Elsevier, Oxford. U. Sommer, Biologische Meereskunde, Springer Verlag, Heidelberg.		
<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		
<b>Examination</b>	<b>Prüfungszeiten</b>	<b>Type of examination</b>	
<b>Final exam of module</b>	Written exam at the end of the Lecture Marine Ecology	1 written exam (Lecture) (50%), 1 oral presentation (Exercise) (50%)	
PLEASE NOTE: 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>
Lecture		4	56
Exercises		6	84
<b>Präsenzzeit Modul insgesamt</b>			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            + 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</p> <p>Upon successful completion of the module the students will gain:</p> <ol style="list-style-type: none"> <li>1. a survey of topical subjects relating to the morphology and phylogeny of animals,</li> <li>2. a thorough knowledge of the development of morphological characteristics,</li> <li>3. technical skills in studying morphological structures, and</li> <li>4. knowledge into recent hypotheses on the phylogeny of animals.</li> </ol>		
<b>Module contents</b>	<p>Lecture: Details regarding the morphology and evolution of Metazoa from an explicit phylogenetic framework            Seminar: Presentation and discussion of recent subjects and issues relating to the evolution of Metazoa; presentation of individual metazoan taxa            Exercise: Preparation and documentation of exemplary species of Metazoa; various field studies (e.g. visit to the Dierenpark Emmen or to the Zoo am Meer (Bremerhaven), sampling aquatic micrometazoans, observing birds)</p>		
<b>Literaturempfehlungen</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%), 1 Portfolio (50%),	
		PLEASE NOTE: 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            ++ knowledge of biological working methods            ++ biologically relevant knowledge in the natural sciences and mathematics            + 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            + knowledge of safety and environmental issues         </p> <p>           This course is designed for students to learn about the basic light and electron optical methods. Students will be able to work with preparative techniques for scanning electron microscopy, trans-mission electron microscopy, and light microscopy, and confocal scanning laser microscopy. Students completing this course will have learned basic principles for fixing and embedding biological materials for electron microscopy. Students will have learned how to operate a transmission electron microscope, a scanning electron microscope, several ultramicrotomes, a vacuum evaporator, a critical point dryer, and a sputter coater. Digital imaging techniques that will be learned will include print making, design and assembly of materials for publication, PowerPoint presentations, and poster design. Students will be introduced to the principles of light microscopy utilizing different optical 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

<b>Module label</b>	Marine Biodiversity
<b>Modulkürzel</b>	bio360
<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>• 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>
<b>Prerequisites</b>	Abschluss der Basismodule
<b>Skills to be acquired in this module</b>	<p>++ biological knowledge ++ knowledge of biological working methods + 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</p> <p>By active participation the students acquire the following knowledge/abilities/qualification:</p> <ul style="list-style-type: none"><li>* Preparation and organization of sampling</li><li>* Keeping organisms – field study</li><li>* Marine deposits, development of marine sediments and their effects on the fauna</li><li>* Methods of meiofauna and macrofauna sampling, also plankton sampling</li><li>* Methods of quantitative community analysis</li><li>* Diversity comparison of various sites applying statistical methods</li><li>* Multivariate statistics for correlation of biocenoses and environmental variables</li><li>* Biocenoses of marine habitats</li><li>* Biology, morphology, systematics, behaviour and ecology of selected taxa in marine water systems</li><li>* Formulation and definition of scientific questions and selection of methods</li><li>* Habitat and biocenoses, interstitial, littoral (lotic, lenitic), diversity</li><li>* Planning behavioural experiments</li><li>* Presentation and discussion of scientific results</li><li>* Independent scientific work in groups and presentation of results</li></ul>
<b>Module contents</b>	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.
<b>Literaturempfehlungen</b>	Literatur: EMSCHERMANN, P., HOFRICHTER, O., KÖRNER, H. & D., ZISSLER, 1992: Meeresbiologische Exkursion – Beobachtung und Experiment. Gustav Fischer Verlag, Stuttgart, Jena, New York. GIERE, O., 2009: Meiobenthology – The Microscopic Motile Fauna of Aquatic Sediments. Springer Verlag, Berlin-Heidelberg. GRZIMEK, B., 1979: Grzimeks Tierleben. 13 Bände. Dtv. GRUNER, H.-E., 1993: Urania Tierreich. 6 Bände. Urania-Verlag Leipzig, Jena, Berlin. GRUNER, H.-E., 1993: „Der Kaestner“, A., Lehrbuch der speziellen Zoologie. All volumes, Gustav Fischer Verlag, Jena, Stuttgart. 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)

Links				
<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>	During lectures	1 Portfolio		
PLEASE NOTE: 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
<b>Präsenzzeit Modul insgesamt</b>				<b>182 h</b>

## bio375 - Flora - Advanced Concepts

<b>Module label</b>	Flora - Advanced Concepts			
<b>Modulkürzel</b>	bio375			
<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			
<b>Skills to be acquired in this module</b>	<p>+ biological knowledge            + knowledge of biological working methods            + deepened expertise in biological specialist field            + independent learning and (research-based) working            + data presentation and evidence-based discussion (written and spoken)            + (scientific) communication skills            + knowledge of safety and environmental issues</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>	<p>The module comprises a lecture in the Botanical Garden, where plants will be observed and investigated. This includes algae, bryophytes, ferns, gymnosperms and various families of angiosperms. The seminar is intended to let students study in-depth additional plant families with their typical characters.</p>			
<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			
<b>Examination</b>	<b>Prüfungszeiten</b>	<b>Type of examination</b>		
<b>Final exam of module</b>				portfolio
<b>Lehrveranstaltungsform</b>	<b>Comment</b>	<b>SWS</b>	<b>Frequency</b>	<b>Workload of compulsory attendance</b>
Lecture		2	SoSe	28
Seminar		2	SoSe	28
<b>Präsenzzeit Modul insgesamt</b>				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 bio375 Flora - Advanced concepts	
<b>Skills to be acquired in this module</b>	<p>+ biological knowledge            + knowledge of biological working methods            + deepened expertise in biological specialist field            + independent learning and (research-based) working            + data presentation and evidence-based discussion (written and spoken)            + (scientific) communication skills            + knowledge of safety and environmental issues</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>Literaturempfehlungen</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	
<b>Examination</b>	<b>Prüfungszeiten</b>	<b>Type of examination</b>
<b>Final exam of module</b>		portfolio
<b>Lehrveranstaltungsform</b>	Exercises	
<b>SWS</b>	4	
<b>Frequency</b>	SoSe	
<b>Workload Präsenzzeit</b>	56 h	

## 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 bio256 Flora and Fauna		
<b>Skills to be acquired in this module</b>	<p>+ biological knowledge            + knowledge of biological working methods            + deepened expertise in biological specialist field            + independent learning and (research-based) working            + data presentation and evidence-based discussion (written and spoken)            + (scientific) communication skills            + knowledge of safety and environmental issues</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		
<b>Examination</b>	<b>Prüfungszeiten</b>	<b>Type of examination</b>	
<b>Final exam of module</b>		portfolio	
<b>Lehrveranstaltungsform</b>	Exercises		
<b>SWS</b>	6		
<b>Frequency</b>	SoSe		
<b>Workload Präsenzzeit</b>	84 h		

## 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 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, Briechle 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			
<b>Examination</b>	<b>Prüfungszeiten</b>	<b>Type of examination</b>		
<b>Final exam of module</b>		exam (50%) protocol (50%)		
<b>Lehrveranstaltungsform</b>	<b>Comment</b>	<b>SWS</b>	<b>Frequency</b>	<b>Workload of compulsory attendance</b>
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 ++ deepened knowledge of biological working methods + scientific/mathematical basic knowledge relevant for biology + critical and analytical thinking ++ data presentation and discussion in German (written and spoken) + teamwork			
<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>Literaturempfehlungen</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			
<b>Examination</b>	<b>Prüfungszeiten</b>	<b>Type of examination</b>		
<b>Final exam of module</b>	end of semester	exam and protocol		
<b>Lehrveranstaltungsform</b>	<b>Comment</b>	<b>SWS</b>	<b>Frequency</b>	<b>Workload of compulsory attendance</b>
Lecture		3	SoSe	42
Seminar		1	SoSe	14
Exercises		4	SoSe	56
Tutorial (optional)			SoSe und WiSe	0
<b>Präsenzzeit Modul insgesamt</b>				<b>112 h</b>

## bio408 - Introduction to Neurobiology I

<b>Module label</b>	Introduction to Neurobiology I		
<b>Modulkürzel</b>	bio408		
<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>• 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>• Dömer, Patrick (Prüfungsberechtigt)</li> </ul>		
<b>Prerequisites</b>	Abschluss der Basismodule		
<b>Skills to be acquired in this module</b>	<p>[nop]++ biologische Fachkenntnisse ++ Kenntnisse biologischer Arbeitstechniken + biologierelevante naturwissenschaftliche/mathematische Grundkenntnisse + Abstraktes, logisches, analytisches Denken ++ Datenpräsentation und evidenzbasierte Diskussion in Wort und Schrift + Teamfähigkeit [/nop]</p>		
<b>Module contents</b>	<p>Der Vorlesungsstoff (3 SWS) umfasst im Teil I die molekularen und zellulären Grundlagen der Neurobiologie, die elektrischen Vorgänge in Nervenzellen, die Organisation und Entwicklung des Nervensystems, die Funktion am Beispiel einfacher Schaltkreise. Im Seminar (1 SWS) werden einzelne Themen aus der Vorlesung vertiefend behandelt.</p>		
<b>Literaturempfehlungen</b>	<p>Purves D. et al.: Neuroscience, Sinauer Associates, Sunderland USA, jeweils neueste Auflage.</p>		
<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>	<p>Aus bio405 und bio408 kann nur 1 Modul gewählt werden.</p> <p>Verknüpft mit den Modulen bio415 und bio416 Einführung in die Neurobiologie II im WS</p>		
<b>Examination</b>	<b>Prüfungszeiten</b>	<b>Type of examination</b>	
<b>Final exam of module</b>		1 Klausur; aktive Teilnahme im Seminar	
<b>Lehrveranstaltungsform</b>	<b>Comment</b>	<b>SWS</b>	<b>Frequency</b>
			<b>Workload of compulsory attendance</b>
Lecture		3	32
Seminar		1	14
Tutorial			0
<b>Präsenzzeit Modul insgesamt</b>			<b>46 h</b>



## bio417 - Introduction to Systems Neurobiology - Theory and Practice

<b>Module label</b>	Introduction to Systems Neurobiology - Theory and Practice			
<b>Modulkürzel</b>	bio417			
<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>• Greschner, Martin (module responsibility)</li> <li>• Beutelmann, Rainer (Module counselling)</li> <li>• Thiel, Christiane Margarete (Module counselling)</li> <li>• Köppl, Christine (Module counselling)</li> <li>• Langemann, Ulrike (Module counselling)</li> <li>• Rosemann, Stephanie (Module counselling)</li> <li>• Greschner, Martin (Prüfungsberechtigt)</li> <li>• Rosemann, Stephanie (Prüfungsberechtigt)</li> <li>• Beutelmann, Rainer (Prüfungsberechtigt)</li> <li>• Thiel, Christiane Margarete (Prüfungsberechtigt)</li> <li>• Köppl, Christine (Prüfungsberechtigt)</li> <li>• Langemann, Ulrike (Prüfungsberechtigt)</li> </ul>			
<b>Prerequisites</b>	Abschluss der Basismodule			
<b>Skills to be acquired in this module</b>	++ deepened biological expertise ++ deepened knowledge of biological working methods ++ data analysis skills ++ data presentation and discussion in German and English (written and spoken) + teamwork + scientific/mathematical basic knowledge relevant for biology + critical and analytical thinking			
<b>Module contents</b>	<p>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.</p> <p>The exercise immediately follows the lecture and the seminar. By experimenting with each other, the students deepen their knowledge in the fields of cognitive neuroscience and hearing science. The students analyze their own data (incl. statistics) and present these in a written report.</p>			
<b>Literaturempfehlungen</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 (100%) practical exercise (ungraded)		
Lehrveranstaltungsform	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		3	WiSe	0
Seminar			WiSe	0
Exercises		4	WiSe	0
<b>Präsenzzeit Modul insgesamt</b>				0 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 ++ deepened knowledge of biological working methods + scientific/mathematical basic knowledge relevant for biology + 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>Literaturempfehlungen</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 + knowledge of biological working methods + biologically relevant knowledge in the natural sciences and mathematics + abstract, logical, analytical thinking + data presentation and evidence-based discussion (written and spoken) ++ (scientific) communication skills			
<b>Module contents</b>	supramolecular organization in the cell, interactions of biomolecules, signalling fluxes			
<b>Literaturempfehlungen</b>	Biochemie, Müller-Esterl Biochemie, Lubert Stryer Lehninger Prinzipien der Biochemie, David L. Nelson und Michael M. Cox 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>				<b>56 h</b>

## 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            ++ knowledge of biological working methods            + biologically relevant knowledge in the natural sciences and mathematics            + abstract, logical, analytical thinking            + deepened expertise in biological specialist field            ++ data presentation and evidence-based discussion (written and spoken)            + teamwork</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

<b>Module label</b>	Microfauna, Mircoflora & Protista of limnic and marine habitats
<b>Modulkürzel</b>	bio440
<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>• Hoppenrath, Mona (Module counselling)</li><li>• Ahlrichs, Wilko (Prüfungsberechtigt)</li><li>• Kieneke, Alexander (Prüfungsberechtigt)</li><li>• Hoppenrath, Mona (Prüfungsberechtigt)</li></ul>
<b>Prerequisites</b>	Abschluss der Basismodule
<b>Skills to be acquired in this module</b>	<p>++ 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</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>
<b>Module contents</b>	<p>We study microfauna and protists of limnic and marine habitats. Microfauna refers to microscopic animals. They live together with protists in 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 gives 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, 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, microscopied, 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 analyses are investigated. The students will create art portraits. The results are communicated in the form of posters, short lectures, and scientific publications.</p>
<b>Literatureempfehlungen</b>	Will be announced in the course.
<b>Links</b>	
<b>Language of instruction</b>	German

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<b>Duration (semesters)</b>	1 Semester			
<b>Module frequency</b>	irregular			
<b>Module capacity</b>	12 ( For more applicants than places, a motivation letter decides on the admission. )			
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>				<b>56 h</b>

## bio450 - Posters, Pictures, Presentations and Papers

<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            + abstract, logical, analytical thinking            + deepened expertise in biological specialist field            ++ independent learning and (research-based) working            ++ data presentation and evidence-based discussion (written and spoken)            ++ (scientific) communication skills            + project and time management</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	
<b>Workload Präsenzzeit</b>	84 h	

## 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>Literatureempfehlungen</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 ( For more applicants than places, a letter of motivation decides on the admission. )			
<b>Reference text</b>	Takes place alternately with Bio472 Marinbiological Course I. (Change between focus on rocky shore / mud flat & sand flat) 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



## bio472 - Marine Biology Field Trip

<b>Module label</b>	Marine Biology Field Trip			
<b>Modulkürzel</b>	bio472			
<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>++biological knowledge            ++knowledge of biological working methods            +biologically relevant knowledge in the natural sciences and mathematics            +abstract, logical, analytical thinking            ++deepened expertise in biological specialist field            ++independent learning and (research-based) working            +data presentation and evidence-based discussion (written and spoken)            ++teamwork            ++(scientific) communication skills            +project and time management</p> <p>In completion of this modul students will: have a basic knowledge of the diversity of marine life; un-derstand 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 ap-proach to scientific research; have developed skills in writing scientific reports and in oral communica-tion 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>Literatureempfehlungen</b>	Will be announced in Studt IP.			
<b>Links</b>				
<b>Language of instruction</b>	German			
<b>Duration (semesters)</b>	1 Semester			
<b>Module frequency</b>	Sommersemester			
<b>Module capacity</b>	14 ( Bei mehr Bewerber_innen als Plätzen entscheidet ein Motivationschreiben über die Aufnahme. )			
<b>Reference text</b>	Takes place alternately with Bio470 Marinbiological Course I. (Change between focus on Felswatt / Sandwatt.) If there are more applicants than places available, a letter of motivation decides on the acceptance.			
<b>Examination</b>	<b>Prüfungszeiten</b>		<b>Type of examination</b>	
<b>Final exam of module</b>			1 Portfolio	
<b>Lehrveranstaltungsform</b>	<b>Comment</b>	<b>SWS</b>	<b>Frequency</b>	<b>Workload of compulsory attendance</b>
Seminar		2	SoSe	28
Exercises		2	SoSe	28
Study trip		2	SoSe	28
<b>Präsenzzeit Modul insgesamt</b>				<b>84 h</b>

## bio473 - Evolutionsgeschichte des Lebens: Leben im Wandel der Erdzeitalter

<b>Module label</b>	Evolutionsgeschichte des Lebens: Leben im Wandel der Erdzeitalter			
<b>Modulkürzel</b>	bio473			
<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>• Ahlrichs, Wilko (Prüfungsberechtigt)</li> </ul>			
<b>Prerequisites</b>	<p>none</p> <p>If there are more applicants than places available, a letter of motivation decides on the acceptance.</p>			
<b>Skills to be acquired in this module</b>	<p>++biological knowledge+knowledge of biological working methods          ++biologically relevant knowledge in the natural sciences and mathematics          ++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)          +(scientific) communication skills</p> <p>Objective of the module/skills:</p> <p>Understanding of continental migration (plate tectonics), the formation of mountains and oceans.</p> <p>Understanding the formation of marine (coastal and deep sea), limnic and terrestrial habitats (e.g. swamp, forest, desert).</p> <p>Understanding the importance of climate change through continental migration, ice ages and climate catastrophes for the evolution of organisms.</p> <p>Knowledge of the phylogenetic system of important groups of organisms, their formation and evolution.</p> <p>Knowledge of the five major extinction events in Earth's history and their significance.</p>			
<b>Module contents</b>	<p>Content of the module:          Earth age, continental migration, formation of marine, limnic and terrestrial habitats, species extinction, mass extinction and their causes (climate change, ice ages) and consequences (extinction and/or renewed radiation); anatomy and morphology ("baupläne") of ancestral species; evolution important characteristic complexes (nutrition, respiration, excretion and osmoregulation, reproduction, movement); important evolutionary steps of selected animals (e.g. molluscs with cephalopods, arthropods with insects, dinosaurs with birds, mammals with humans), taxa of plants and protists in the conquest of marine, limnic and terrestrial habitats.</p>			
<b>Literatureempfehlungen</b>	Will be announced in Studt IP.			
<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 ( Sind mehr BewerberInnen als Plätze vorhanden, entscheidet ein Motivationsschreiben über die Annahme. )			
<b>Examination</b>	<b>Prüfungszeiten</b>	<b>Type of examination</b>		
<b>Final exam of module</b>	<b>End of module</b>	<b>Portfolio</b>		
<b>Lehrveranstaltungsform</b>	<b>Comment</b>	<b>SWS</b>	<b>Frequency</b>	<b>Workload of compulsory attendance</b>
Seminar		2	SoSe	28

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Lehrveranstaltungsform	Comment	SWS	Frequency	Workload of compulsory attendance
Exercises		1	SoSe	14
Study trip		1	SoSe	14
<b>Präsenzzeit Modul insgesamt</b>				<b>56 h</b>

## 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            + knowledge of biological working methods            + biologically relevant knowledge in the natural sciences and mathematics            + interdisciplinary knowledge &amp; thinking            + abstract, logical, analytical thinking            ++ deepened expertise in biological specialist field            + 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            Students understand the concepts of allometry and scaling            Students put this knowledge in the context of theoretical concepts of ecology and evolution            Students learn experimental techniques in diverse topics, e.g. biomechanics or water relations</p>			
<b>Module contents</b>	V: Functional Morphology of Plants (1 SWS) E: Mikroskopie, biomechanical Experiments, Form/Function Experiments regarding water uptake, storage and loss (2 SWS) S new studies in the field of functional morphology (1 SWS)			
<b>Literatureempfehlungen</b>	Kadereit JW, et al (2014) Strasburger Lehrbuch der Botanik. 37. Aufl. Spektrum Akademischer Verlag Eschrich, W. (1995) Funktionelle Pflanzenanatomie. Springer			
<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			
<b>Examination</b>	Prüfungszeiten		Type of examination	
<b>Final exam of module</b>			1 Portfolio (oral presentation and 1 report) OR 1 Written examination	
<b>Lehrveranstaltungsform</b>	<b>Comment</b>	<b>SWS</b>	<b>Frequency</b>	<b>Workload of compulsory attendance</b>
Lecture		1	WiSe	14
Seminar		1	WiSe	14
Exercises		2	WiSe	28
<b>Präsenzzeit Modul insgesamt</b>				<b>56 h</b>

# Abschlussmodul

## bam - Bachelor's Thesis Module

<b>Module label</b>	Bachelor's Thesis Module		
<b>Modulkürzel</b>	bam		
<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; Abschlussmodul</li> </ul>		
<b>Zuständige Personen</b>	<ul style="list-style-type: none"> <li>der Biologie, Lehrende (Prüfungsberechtigt)</li> </ul>		
<b>Prerequisites</b>			
<b>Skills to be acquired in this module</b>	<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          ++ knowledge of biological working methods          + statistics &amp; scientific programming          + abstract, logical, analytical thinking          ++ deepened expertise in biological specialist field          ++ independent learning and (research-based) working          ++ data presentation and evidence-based discussion (written and spoken)          + (scientific) communication skills          ++ project and time management</p>		
<b>Module contents</b>	<p>Preparing the Bachelor thesis          Active participation in the seminar of the research group, in which the Bachelor's thesis is written</p>		
<b>Literatureempfehlungen</b>	<p>Supervisors may supply an initial reading list with important literature. The students are expected to find and use further literature as needed.</p>		
<b>Links</b>			
<b>Languages of instruction</b>	German, English		
<b>Duration (semesters)</b>	1 Semester		
<b>Module frequency</b>	halbjährlich		
<b>Module capacity</b>	unlimited		
<b>Examination</b>	<b>Prüfungszeiten</b>	<b>Type of examination</b>	
<b>Final exam of module</b>		Bachelor's thesis (12 CP) and accompanying seminar (3 CP)	
<b>Lehrveranstaltungsform</b>	Seminar		
<b>SWS</b>	1		
<b>Frequency</b>	--		
<b>Workload Präsenzzeit</b>	14 h		

