
Modulhandbuch

Biology - Dual-Subject Bachelor's Programme

im Sommersemester 2020

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Basismodule

bio215 - Introduction to Biology

Module label	Introduction to Biology			
Modulkürzel	bio215			
Credit points	9.0 KP			
Workload	270 h			
Verwendbarkeit des Moduls	• Bachelor's Programme Biology (Bachelor) > Basismodule • Bachelor's Programme Mathematics (Bachelor) > Nebenfachmodule • Dual-Subject Bachelor's Programme Biology (Bachelor) > Basismodule			
Zuständige Personen	• Gerlach, Gabriele (module responsibility) • Zotz, Gerhard (Module counselling) • Sienknecht, Ulrike (Module counselling) • Gerlach, Gabriele (Prüfungsberechtigt) • Zotz, Gerhard (Prüfungsberechtigt) • Köppl, Christine (Prüfungsberechtigt) • Sienknecht, Ulrike (Prüfungsberechtigt) • Käfer, Simon (Prüfungsberechtigt)			
Prerequisites				
Skills to be acquired in this module	++ biological eknowledge ++ biologically relevant knowledge in the natural sciences and mathematics ++ interdisciplinary knowledge & thinking ++ abstract, logical, analytical thinking			
	Qualifications that the module provides • The theoretical basics of the different disciplines of biology are acquired • The overview gained enables the students to start their individual study planning, which fits their inclinations and abilities • 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.			
Module contents	Lecture conveys knowledge in - evolution, ecology and biodiversity (WiSe) - animal physiology and developmental biology (SoSe)			
Literatureempfehlungen	Campbell et al. "Biologie", Pearson Sadava et al. "Purves, Biologie", Springer			
Links				
Language of instruction	German			
Duration (semesters)	2 Semester			
Module frequency	jährlich			
Module capacity	300			
Examination	Prüfungszeiten		Type of examination	
Final exam of module	lecture-free periods after each series		2 written examinations (WiSe and SoSe)	
Lehrveranstaltungsform	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		12	SoSe und WiSe	168
Seminar (Gefahrstoffverordnung und Arbeitsschutz (PFLICHT für Erstsemester!))			WiSe	0
Tutorial (optional)			--	0
Präsenzzeit Modul insgesamt	168 h			

bio220 - Introductory Zoology-Botany

Module label	Introductory Zoology-Botany
Modulkürzel	bio220
Credit points	9.0 KP
Workload	270 h
Verwendbarkeit des Moduls	• Bachelor's Programme Biology (Bachelor) > Basismodule • Dual-Subject Bachelor's Programme Biology (Bachelor) > Basismodule
Zuständige Personen	• Ahlrichs, Wilko (module responsibility) • Will, Maria (module responsibility) • Bininda-Emonds, Olaf (Module counselling) • Zotz, Gerhard (Module counselling) • Ahlrichs, Wilko (Prüfungsberechtigt) • Will, Maria (Prüfungsberechtigt) • Zotz, Gerhard (Prüfungsberechtigt) • Bininda-Emonds, Olaf (Prüfungsberechtigt) • Plewka, Isabelle (Prüfungsberechtigt) • Käfer, Simon (Prüfungsberechtigt)
Prerequisites	keine
Skills to be acquired in this module	++ biological knowledge + knowledge of biological working methods ++ biologically relevant knowledge in the natural sciences and mathematics + abstract, logical, analytical thinking + independent learning and (research-based) working + teamwork THEORY: * To understand the fundamentals of reconstructing phylogenetic relationships * To know the phylogenetic system and ground pattern of high-ranking ancestral animal species * To know the cell structures, organization, and reproduction of plants and animals * To know the morphology and anatomy of individual species PRACTICE: * To improve and verify the theoretical knowledge acquired from lectures and textbooks by studying the original * To train visual and tactile perception by studying various species * To learn that representations in textbooks are abstractions of a much more complex reality * To be able to criticize representations in textbooks and models * To acquire the knowledge of the function in living animals and plants by studying preserved specimens * Learning how to follow preparation instructions * Learning that the organization of individual species may be highly variable * Preparing records or drawings from the information obtained by original specimens studied
Module contents	GENERAL: Light microscopic methods are applied to study structures in plants and animals. Records in the form of descriptions and drawings. BOTANY: Morphological structure and reproduction of various plant organization types with a focus on the structure of plant tissue. Representation of the relationships between structure and function with regard to absorption processes, transport processes, transpiration, and photosynthesis. 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.
Literatureempfehlungen	GENERAL:: Campbell: Biologie (Spektrum Verlag) or Purves: Biologie (Spektrum Verlag), latest edition ZOOLOGY: V. Storch: Kükenenthal Zoologisches Praktikum, one of the latest

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

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

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

bio233 - Basics in Microbiology and Genetics

Module label	Basics in Microbiology and Genetics			
Modulkürzel	bio233			
Credit points	6.0 KP			
Workload	180 h			
Verwendbarkeit des Moduls	• Bachelor's Programme Biology (Bachelor) > Basismodule • Dual-Subject Bachelor's Programme Biology (Bachelor) > Basismodule			
Zuständige Personen	• Rabus, Ralf Andreas (module responsibility) • Claußen, Maike (Module counselling) • Rabus, Ralf Andreas (Prüfungsberechtigt) • Claußen, Maike (Prüfungsberechtigt)			
Prerequisites				
Skills to be acquired in this module	++ biological knowledge + knowledge of biological working methods + biologically relevant knowledge in the natural sciences and mathematics + deepened expertise in biological specialist field + independent learning and (research-based) working			
Module contents	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			
Literaturempfehlungen	Purves Biologie (Spektrum Verlag), neuste Ausgabe Campbell et al., Biologie (Pearson Verlag), neuste Ausgabe Fuchs, Allgemeine Mikrobiologie (Thieme Verlag), neueste Auflage			
Links				
Language of instruction	German			
Duration (semesters)	1 Semester			
Module frequency	Sommersemester			
Module capacity	unlimited			
Reference text	Modul für Studierende mit Studienbeginn vor dem WiSe 23/24. (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.			
Examination	Prüfungszeiten	Type of examination		
Final exam of module	Klausuren direkt nach jeweiligem Veranstaltungsteil	2 Prüfungsleistungen: • 1 Klausur (50 %) nach dem Teil Mikrobiologie • 1 Klausur (50 %) nach dem Teil Genetik		
Lehrveranstaltungsform	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		4	SoSe	56
Tutorial (optional)			SoSe	0
Präsenzzeit Modul insgesamt				56 h

bio236 - Basics in Biochemistry and Cell Biology

Module label	Basics in Biochemistry and Cell Biology	
Modulkürzel	bio236	
Credit points	6.0 KP	
Workload	180 h	
Verwendbarkeit des Moduls	• Bachelor's Programme Biology (Bachelor) > Basismodule • Dual-Subject Bachelor's Programme Biology (Bachelor) > Basismodule	
Zuständige Personen	• Koch, Karl-Wilhelm (module responsibility) • Winklhofer, Michael (Module counselling) • Koch, Karl-Wilhelm (Prüfungsberechtigt) • Winklhofer, Michael (Prüfungsberechtigt)	
Prerequisites		
Skills to be acquired in this module	++ biological knowledge + knowledge of biological working methods ++ biologically relevant knowledge in the natural sciences and mathematics + abstract, logical, analytical thinking	
Module contents	Introduction to structure and function of main biochemical building blocks; amino acids, carbohydrates, proteins, nucleic acids, introduction to metabolism; biological membranes and transmembrane transport; structure and function of cell organelles; protein synthesis and posttranslational modification, intracellular transport and trafficking, signalling agents and cellular communication, cell division, controlled cell death	
Literatureempfehlungen	Biochemie, Müller-Esterl 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	
Links		
Language of instruction	German	
Duration (semesters)	1 Semester	
Module frequency	Wintersemester	
Module capacity	unlimited	
Reference text	Modul für Studierende mit Studienbeginn vor dem WiSe 23/24 . (Übergangsbestimmung bis zum Sommersemester 2025; auf Antrag und mit Zustimmung des Prüfungsausschusses ist für Studierende mit einem Studienbeginn vor WiSe 2023/24 auch ein Wechsel in die aktuelle Prüfungsordnung möglich). Studierende mit Studienbeginn ab dem WiSe 23/24 studieren das Modul bio225.	
Examination	Prüfungszeiten	Type of examination
Final exam of module	during the semester	written exam
Lehrveranstaltungsform	Lecture	
SWS	4	
Frequency	WiSe	
Workload Präsenzzeit	56 h	

bio239 - Didactical Exercises and Genetics

Module label	Didactical Exercises and Genetics			
Modulkürzel	bio239			
Credit points	6.0 KP			
Workload	180 h			
Verwendbarkeit des Moduls	Dual-Subject Bachelor's Programme Biology (Bachelor) > Basismodule			
Zuständige Personen	- Hößle, Corinna (module responsibility) - Weusmann, Birgit (Module counselling) - Kapteina, Ulrich (Module counselling) - Knapp, Edgar (Module counselling) - Plewka, Isabelle (Module counselling) - Claußen, Maike (Module counselling) - Hößle, Corinna (Prüfungsberechtigt) - Claußen, Maike (Prüfungsberechtigt) - Weusmann, Birgit (Prüfungsberechtigt) - Kapteina, Ulrich (Prüfungsberechtigt) - Knapp, Edgar (Prüfungsberechtigt) - Plewka, Isabelle (Prüfungsberechtigt)			
Prerequisites				
Skills to be acquired in this module	- Die Studierenden erwerben genetische Fachkenntnisse - Entwicklung bzw. Adaptation von Lerneinheiten an Lernausgangssituation von Schülern - Erprobung dieser Lerneinheiten ohne und mit Schülern, anschließende Reflexion			
Module contents	Teil 1: Grundlagen der 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. (Studierende mit dem Ziel "Master of Education" müssen nur den Vorlesungsteil "Genetik" belegen, der ab der 2. Semesterhälfte stattfindet.) Teil 2: Didaktische Übungen: In der ersten Phase begleiten Studierende Umweltpädagogen der Grünen Schule oder anderer außerschulischer Lernstandorte (Regionalen Umweltbildungszentrum Oldenburg, Park der Gärten) und lernen im Selbsttest verschiedene Aktionskonzepte kennen. Diese Konzeptionen werden anschließend an ausgewählte Lerngruppen adaptiert und untereinander erprobt (Phase 2). In der dritten Phase können Studierende die Lernprozesse der Schüler selbst anregen, indem sie selbst im Teamteaching unterrichten. In einer abschließenden Reflexion werden die Erfahrungen gesammelt und eingeordnet (Phase 4).			
Literaturempfehlungen	Genetik: Purves Biologie (Spektrum Verlag), neuste Ausgabe Campbell et al., Biologie (Pearson Verlag), neuste Ausgabe Didaktik: Raith, A. & Lude, A. (2014): Startkapital Natur: Wie Naturerfahrung die kindliche Entwicklung fördert. München: oekom			
Links				
Language of instruction	German			
Duration (semesters)	1 Semester			
Module frequency				
Module capacity	4 x 16 Studierende			
Examination	Prüfungszeiten		Type of examination	
Final exam of module	Klausur im Anschluss an Vorlesungsteil Genetik		KL	
Lehrveranstaltungsform	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		2	SoSe oder WiSe	28
Seminar		2	SoSe oder WiSe	28
Präsenzzeit Modul insgesamt				56 h

Aufbaumodule

bio100 - Introduction into Didactics of Biology

Module label	Introduction into Didactics of Biology	
Modulkürzel	bio100	
Credit points	6.0 KP	
Workload	180 h	
Verwendbarkeit des Moduls	• Dual-Subject Bachelor's Programme Biology (Bachelor) > Aufbaumodule • Master of Education Programme (Special Needs Education) Biology (Master of Education) > Mastermodule	
Zuständige Personen	• Hößle, Corinna (Module counselling) • Rathje, Wiebke (Module counselling) • Hößle, Corinna (module responsibility) • Hößle, Corinna (Prüfungsberechtigt) • Rathje, Wiebke (Prüfungsberechtigt) • Winkler, Holger (Prüfungsberechtigt)	
Prerequisites		
Skills to be acquired in this module	Skills taught by this module: The students will be introduced to the basics of didactics of biology. In the beginning the focus will lie on the standards of education and school-curriculums. Afterwards scientific methods, different methods of education, media, social forms and the culture of problem solving in biological classes will be reflected and realized by concrete examples out of everyday practice (micro-teaching). During the second half of the module the students will be able to conceive and reflect own concepts of teaching. Furthermore the possibilities of studying in out-of-school-facilities will be fathomed, excursions planned, realized and reflected. Importance of this module during the studies: Teaching skills for all fields of study (compulsory subject for following degrees: teaching post in primary school (Grundschule), extended elementary school (Hauptschule) and secondary school (Realschule)).	
Module contents	3. semester: seminar Introduction to curricular standards, media, methods, social forms, concepts of pupils, instruments of diagnosis, natural scientific methods, culture of exercises in biological classes. Construction of teaching that considers social matters and the environment of the pupils. 4. semester: seminar and excursions Forms and places for teaching biology, methods and media for teaching biological contents in different spheres of activity (scientific museums, botanical and zoological gardens, regional environmental centers, the Wadden Sea national park).	
Literatureempfehlungen	Eschenhagen/Kattmann/Rodi: Fachdidaktik Biologie, Aulis, 2007. Spörhase-Eichmann, Ruppert (Hrsg.): Biologie Didaktik. Praxishandbuch für die Sekundarstufe I und II. Cornelsen Verlag Scriptor GmbH & Co. KG., Berlin (2004).	
Links		
Language of instruction	German	
Duration (semesters)	2 Semester	
Module frequency	jährlich	
Module capacity	unlimited	
Examination	Prüfungszeiten	Type of examination
Final exam of module	Papers have to be presented or handed in: one week after the end of the course	1 portfolio
Lehrveranstaltungsform	Seminar	
SWS	4	
Frequency		
Workload Präsenzzeit	56 h	

bio110 - Practical Biology Experiments for Science Education

Module label	Practical Biology Experiments for Science Education
Modulkürzel	bio110
Credit points	6.0 KP
Workload	180 h
Verwendbarkeit des Moduls	• Dual-Subject Bachelor's Programme Biology (Bachelor) > Aufbaumodule • Master of Education Programme (Gymnasium) Biology (Master of Education) > Mastermodule • Master of Education Programme (Special Needs Education) Biology (Master of Education) > Mastermodule
Zuständige Personen	• Rathje, Wiebke (module responsibility) • Hößle, Corinna (Module counselling) • Rathje, Wiebke (Module counselling) • Rathje, Wiebke (Prüfungsberechtigt) • Plewka, Isabelle (Prüfungsberechtigt) • Wübben, Anja (Prüfungsberechtigt)
Prerequisites	Voraussetzung an der Teilnahme ist der erfolgreiche Abschluss des Moduls bio100.
Skills to be acquired in this module	Die Studierenden erwerben folgende Kompetenzen: Studierende • lernen basale Arbeits- und Erkenntnismethoden der Biologie unter besonderer Berücksichtigung der Zoologie und Botanik kennen und wenden diese bei der Planung von Lernarrangements an • verfügen insbesondere über Kenntnisse und Fähigkeiten im hypothesengeleiteten Experimentieren, im kriteriengeleiteten Vergleichen, beim Nutzen von Modellen sowie im Handhaben von schulrelevanten Geräten • verfügen über grundlegende Kenntnisse allgemeiner Experimentiermethoden • können Unterrichtskonzepte und -medien fachgerecht gestalten und inhaltlich bewerten. • kennen Möglichkeiten zur Gestaltung von Lernarrangements insbesondere unter Berücksichtigung heterogener Lernvoraussetzungen • verfügen über grundlegende Kenntnisse zu potentiellen Lernschwierigkeiten und zu der Vielfalt von Schülervorstellungen in den behandelten Themengebieten unter Inklusionsbedingungen sowie über Grundlagen Standard- und kompetenzorientierten Vermittlungsprozesse in heterogenen Lerngruppen • können auf der Grundlage ihrer fachbezogenen Expertise hinsichtlich Planung und Gestaltung eines inklusiven Unterrichts mit sonderpädagogisch qualifizierten Lehrkräften gemeinsame fachliche Lernangebote entwickeln. • können digitale Lernmittel in ihren Lernarrangements integrieren und sie zur Differenzierung und individuellen Förderung im Unterricht einsetzen. • sind in der Lage, Entwicklungen im Bereich Digitalisierung aus fachlicher und fachdidaktischer Sicht angemessen zu rezipieren sowie Möglichkeiten und Grenzen der Digitalisierung kritisch zu reflektieren. Sie können die daraus gewonnenen Erkenntnisse in fachdidaktischen Kontexten nutzen sowie in die Weiterentwicklung unterrichtlicher und curricularer Konzepte einbringen. Sie sind sensibilisiert für die Chancen digitaler Lernmedien hinsichtlich Barrierefreiheit und nutzen digitale Medien auch zur Differenzierung und individuellen Förderung im Unterricht
Module contents	Das Modul umfasst ein Seminar und eine Übung. Im Rahmen der praktischen Übung lernen die Studierenden klassische und innovative Schulversuche zur Botanik und Zoologie kennen. Sie werden aufgefordert die Versuche unter Einbezug digitaler Werkzeuge eigenständig vorzubereiten, durchzuführen und zu reflektieren. Die Studierenden erlernen dabei basale biologische Arbeits-Erkenntnismethoden und entwickeln Lernarrangements zum hypothesengeleiteten Experimentieren. Im Seminar entwickeln und verschriftlichen die Studierenden unter dem Einbezug sonderpädagogischer Fallbeispiele Unterrichtskonzepte für heterogene sowie inklusive Lerngruppen und diskutieren diese gemeinsam. Die Studierenden üben sich so in der Entwicklung von inklusiven

Lernarrangements, deren Ziel es ist, naturwissenschaftliche Arbeits- und Denkweisen in heterogenen Lerngruppen zu fördern.

Literaturempfehlungen

- Campbell Biologie, 11., aktualisierte Auflage, Hallbergmoos: Pearson, 2019
- Purves Biologie, David. Sadava ; Jürgen Markl, 10th ed. 2019., Berlin, Heidelberg: Springer Berlin Heidelberg : Imprint: Springer Spektrum, 2019
- Fachdidaktik Biologie, Harald Gropengießer ; Ute Harms, Hannover: Aulis Verlag in Friedrich Verlag GmbH, 2023
- Schülervorstellungen im Biologieunterricht : Ursachen für Lernschwierigkeiten Marcus Hammann; Roman Asshoff, 4. Auflage, Seelze: Klett/Kallmeyer, 2019
- Lernprozesse digital unterstützen : ein Methodenbuch für den Unterricht, Monika Heusinger, 2. Auflage, Weinheim Basel: Beltz, 2022
- Nerdel, C. (2017). Grundlagen der Naturwissenschaftsdidaktik. Berlin, Heidelberg, Germany: Springer Berlin Heidelberg.
- Weitzel, H., Schaal, S. (2016). Biologie unterrichten: planen, durchführen, reflektieren. Cornelsen Berlin

Links				
Language of instruction		German		
Duration (semesters)		1 Semester		
Module frequency		jährlich		
Module capacity		unlimited		
Examination		Prüfungszeiten		Type of examination
Final exam of module				1 Portfolio zu einem ausgewählten Schulversuch; aktive Teilnahme in Seminar und Praktikum
Lehrveranstaltungsform	Comment	SWS	Frequency	Workload of compulsory attendance
Seminar		2		28
Practical training		3		42
Präsenzzeit Modul insgesamt				
70 h				

bio245 - Flora and Fauna

Module label	Flora and Fauna			
Modulkürzel	bio245			
Credit points	9.0 KP			
Workload	270 h			
Verwendbarkeit des Moduls	• Bachelor's Programme Biology (Bachelor) > Aufbaumodule • Dual-Subject Bachelor's Programme Biology (Bachelor) > Aufbaumodule • Master of Education Programme (Special Needs Education) Biology (Master of Education) > Mastermodule			
Zuständige Personen	• Albach, Dirk Carl (module responsibility) • Will, Maria (Module counselling) • Wilke, Tanja (Module counselling) • von Hagen, Klaus Bernhard (Module counselling) • Albach, Dirk Carl (Prüfungsberechtigt) • Will, Maria (Prüfungsberechtigt) • Wilke, Tanja (Prüfungsberechtigt) • Donat, Frank Henrik (Prüfungsberechtigt) • von Hagen, Klaus Bernhard (Prüfungsberechtigt) • Plewka, Isabelle (Prüfungsberechtigt)			
Prerequisites				
Skills to be acquired in this module	+ biological knowledge + knowledge of biological working methods + independent learning and (research-based) working + knowledge of safety and environmental issues To determine species-rich taxa and to verify the results independently using relevant literature			
Module contents	Lecture: Introduction to the variety of indigenous flora and fauna, presentation of important plant families and animal groups, studying the characteristics important for determination, introduction to systematics. Moreover, subjects are included that present ecological aspects of the taxa dealt with. Exercise: Applying literature to determine animal and plant species and to classify them systematically. Field Exercise: Excursions to the characteristic North German biotopes. The excursions focus on correct identification and classification of plants and animals according to the properties of the living organism.			
Literatureempfehlungen	Botany: Rothmaler - Exkursionsflora von Deutschland, Band 2 - Grundband, Spektrum Akademischer Verlag Zoology: M. Schaefer: Brohmer - Fauna von Deutschland, from 20th edition			
Links				
Language of instruction	German			
Duration (semesters)	1 oder 2 Semester			
Module frequency	jährlich			
Module capacity	unlimited (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.)			
Reference text	Modul für - Studierende des Fachbachelors mit Studienbeginn ab dem WiSe 23/24 sowie für - Lehramts-Studierende und 2FB-Studierende ohne Lehramtsorientierung mit Studienbeginn vor dem WiSe 23/24 . (Übergangsbestimmung bis zum Sommersemester 2025; auf Antrag und mit Zustimmung des Prüfungsausschusses ist auch ein Wechsel in die aktuelle Prüfungsordnung möglich)			
Examination	Prüfungszeiten	Type of examination		
Final exam of module	Botany: Written examination before the end of the lecture 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

Lehrveranstaltungsform	Comment	SWS	Frequency	Workload of compulsory attendance
Vorlesung und Übung (inkl. Geländeübung)		5	SoSe und WiSe	70
Präsenzzeit Modul insgesamt				84 h

bio255 - Fundamentals of Molecular Ecology

Module label	Fundamentals of Molecular Ecology			
Modulkürzel	bio255			
Credit points	9.0 KP			
Workload	270 h			
Verwendbarkeit des Moduls	• Bachelor's Programme Biology (Bachelor) > Aufbaumodule • Dual-Subject Bachelor's Programme Biology (Bachelor) > Aufbaumodule			
Zuständige Personen	• Nolte, Arne (module responsibility) • Nolte, Arne (Prüfungsberechtigt)			
Prerequisites				
Skills to be acquired in this module	++ biological knowledge ++ knowledge of biological working methods ++ biologically relevant knowledge in the natural sciences and mathematics + statistics & scientific programming ++ interdisciplinary knowledge & thinking ++ abstract, logical, analytical thinking ++ deepened expertise in biological specialist field The field of molecular ecology examines relationships among genotypes, phenotypes and the environment to explain evolution and diversity of organisms. The lecture will introduce basics in genomics, molecular evolution and population genetics to explore properties of the genome and the organism from an evolutionary perspective. Central aspects are the adaptation of species to their environment and ecological change, speciation, the genetic basis of phenotypic change. Methods and data used in genomics and molecular ecology will be introduced during the lecture and exercises.			
Module contents	Lecture: the lecture conveys knowledge about the fields of genomics, evolution and organismic biology. Moreover laboratory methods as well as basics and background information on the analysis of genetic and genomic datasets are given. Excercise: Modern data sets and up to date methods in genomics and population genetics are introduced. The practical emphasizes computer based data analyses.			
Literatureempfehlungen				
Links				
Language of instruction	German			
Duration (semesters)	1 Semester			
Module frequency	jährlich			
Module capacity	30			
Examination	Prüfungszeiten		Type of examination	
Final exam of module			exam	
Lehrveranstaltungsform	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		1.5	WiSe	21
Exercises		4.5	WiSe	63
Präsenzzeit Modul insgesamt				84 h

Module label	General Microbiology			
Modulkürzel	bio265			
Credit points	9.0 KP			
Workload	270 h ()			
Verwendbarkeit des Moduls	- Bachelor's Programme Biology (Bachelor) > Aufbaumodule - Bachelor's Programme Environmental Science (Bachelor) > Wahlpflichtmodule - Dual-Subject Bachelor's Programme Biology (Bachelor) > Aufbaumodule			
Zuständige Personen	- Rabus, Ralf Andreas (module responsibility) - Wühlbrand, Lars (Module counselling) - Rabus, Ralf Andreas (Prüfungsberechtigt) - Wühlbrand, Lars (Prüfungsberechtigt)			
Prerequisites				
Skills to be acquired in this module	Basic knowledge of microbiology; ability to assess and apply fundamental microbiological techniques.			
Module contents	Imparting basic microbiological skills and working methods: Chemistry and structure of the cell, fundamentals of metabolism, taxonomy and phylogeny of microorganisms, diversity of microorganisms, insight into Applied Microbiology, propagation of microorganisms.			
Literatureempfehlungen	Allgemeine Mikrobiologie, Schlegel 1992; Brock-Biology of Microorganisms, eds.: Madigan et al., 2003; Grundlagen der Mikrobiologie, Cypionka, 2003			
Links	http://www-icbm.de/~gmb/11429.html			
Language of instruction	German			
Duration (semesters)	1 Semester			
Module frequency	jährlich			
Module capacity	unlimited			
Examination	Prüfungszeiten	Type of examination		
Final exam of module		1 written examination		
		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	WiSe	28
Seminar		1	WiSe	14
Practical training		4	WiSe	56
Präsenzzeit Modul insgesamt				98 h

bio275 - Basics in Physiology

Module label	Basics in Physiology			
Modulkürzel	bio275			
Credit points	9.0 KP			
Workload	270 h			
Verwendbarkeit des Moduls	• Bachelor's Programme Biology (Bachelor) > Aufbaumodule • Bachelor's Programme Mathematics (Bachelor) > Nebenfachmodule • Dual-Subject Bachelor's Programme Biology (Bachelor) > Aufbaumodule			
Zuständige Personen	• Heyers, Dominik (module responsibility) • Köppl, Christine (Module counselling) • Dedek, Karin (Module counselling) • Heyers, Dominik (Prüfungsberechtigt) • Köppl, Christine (Prüfungsberechtigt) • Dedek, Karin (Prüfungsberechtigt)			
Prerequisites				
Skills to be acquired in this module	++ biological knowledge ++ knowledge of biological working methods + biologically relevant knowledge in the natural sciences and mathematics + statistics & scientific programming ++ abstract, logical, analytical thinking + deepened expertise in biological specialist field ++ independent learning and (research-based) working + teamwork Basic knowledge on physiological processes and their underlying mechanisms with a focus on human physiology. Designing, performing, documenting and analysing physiological experiments; troubleshooting, basic statistics, "experimental thinking".			
Module contents	The lecture covers topics such as cell physiology, sensory physiology, neurophysiology, functions of the vegetative system, blood physiology/immune response, blood cycle, respiration and digestion. Emphasis will be on human physiology. In the following lab exercises, students get the opportunity to perform physiological experiments linking to topics from the lecture. By performing experiments on themselves and computer simulations students will gain insight into the underlying physiological principles.			
Literatureempfehlungen	Klinke, Pape, Kurtz, Silbernagl: Physiologie, Aufl. 4, 2014 Schmidt, Lang, Heckmann: Physiologie des Menschen mit Pathophysiologie, Aufl. 31, 2011 Wehner, Gehring: Zoologie, Aufl. 25, 2013			
Links				
Language of instruction	German			
Duration (semesters)	1 Semester			
Module frequency	jährlich			
Module capacity	144			
Examination	Prüfungszeiten	Type of examination		
Final exam of module	within a few weeks after the winter term lecture period	written exam (100%) To qualify for the exam, the following additional requirements need to be met: - regular participation in the laboratory experiments (no more than 1 day of absence) - lab protocols for each experiment which have been accepted by the respective supervisors 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		4	WiSe	56
Exercises	A C H T U N G Die endgültige Einteilung für die Teilkurse wird über Stud.IP vorgenommen. Bitte achten	2	WiSe	28

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

bio295 - Genetics

Module label	Genetics			
Modulkürzel	bio295			
Credit points	9.0 KP			
Workload	270 h			
Verwendbarkeit des Moduls	• Bachelor's Programme Biology (Bachelor) > Aufbaumodule • Dual-Subject Bachelor's Programme Biology (Bachelor) > Aufbaumodule • Master of Education Programme (Special Needs Education) Biology (Master of Education) > Frühere Module			
Zuständige Personen	• Claußen, Maike (module responsibility) • Hartmann, Anna-Maria (Module counselling) • Nothwang, Hans Gerd (Module counselling) • Ebbers, Lena (Module counselling) • Claußen, Maike (Prüfungsberechtigt) • Nothwang, Hans Gerd (Prüfungsberechtigt) • Hartmann, Anna-Maria (Prüfungsberechtigt) • Ebbers, Lena (Prüfungsberechtigt) • Schinzel, Friedrich (Prüfungsberechtigt)			
Prerequisites				
Skills to be acquired in this module	++ biological knowledge ++ knowledge of biological working methods + biologically relevant knowledge in the natural sciences and mathematics + abstract, logical, analytical thinking ++ deepened expertise in biological specialist field ++ independent learning and (research-based) working ++ data presentation and evidence-based discussion (written and spoken) + teamwork ++ (scientific) communication skills + project and time management + knowledge of safety and environmental issues Fundamentals of genetics, performing experiments, quantitative analyses.			
Module contents	general and molecular genetics; mechanisms of mutation, recombination, DNA repair, regulation of transcription; quantitative experiments, prokaryotes and eukaryotes, human genome project, personalized medicine, genetic engineering, safety regulations, sterile working			
Literatureempfehlungen	Campbell/Reece Biologie (latest edition, Pearson Verlag), Strachan & Read Molekulare Humangenetik (latest edition, Spektrum Verlag); Purves Biologie (latest edition, Spektrum Verlag).			
Links				
Language of instruction	German			
Duration (semesters)	1 Semester			
Module frequency	jährlich			
Module capacity	72			
Examination	Prüfungszeiten		Type of examination	
Final exam of module			Written examination (100%), ungraded presentation, protocol	
Lehrveranstaltungsform	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		1.5	WiSe	21
Exercises		3	WiSe	42
Seminar		1.5	WiSe	21
Präsenzzeit Modul insgesamt	84 h			

Akzentsetzungsmodule

bio300 - Evolutionary Biology

Module label	Evolutionary Biology			
Modulkürzel	bio300			
Credit points	15.0 KP			
Workload	450 h			
Verwendbarkeit des Moduls	• Bachelor's Programme Biology (Bachelor) > Akzentsetzungsmodule • Dual-Subject Bachelor's Programme Biology (Bachelor) > Akzentsetzungsmodule • Master of Education Programme (Gymnasium) Biology (Master of Education) > Mastermodule			
Zuständige Personen	• Bininda-Emonds, Olaf (module responsibility) • Bininda-Emonds, Olaf (Prüfungsberechtigt) • Ahlrichs, Wilko (Prüfungsberechtigt) • Albach, Dirk Carl (Prüfungsberechtigt) • Gerlach, Gabriele (Prüfungsberechtigt) • Nolte, Arne (Prüfungsberechtigt)			
Prerequisites	Abschluss der Basismodule			
Skills to be acquired in this module	++ biological knowledge + knowledge of biological working methods ++ biologically relevant knowledge in the natural sciences and mathematics + statistics & scientific programming + interdisciplinary knowledge & thinking + abstract, logical, analytical thinking ++ deepened expertise in biological specialist field + independent learning and (research-based) working ++ data presentation and evidence-based discussion (written and spoken) + teamwork ++ (scientific) communication skills + project and time management Introduction to both microevolution (speciation and species concepts, adaptation and selection, behavioural ecology, reproduction systems) and macroevolution. Introduction to phylogenetics (phyloinformatics, molecular systematics, phylogeography).			
Module contents	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.			
Literatureempfehlungen	Freeman, S. and C.J. Herron. 2007. Evolutionary analysis. 4th edition. 800 pp.; Futuyma, D.J. 2007. Evolution. The original with translation. Spektrum Akademischer Verlag. 607 pp.; Knoop, V. and K. Müller. 2009. Gene und Stammbäume: ein Handbuch zur molekularen Phylogenetik. 2. Auflage. Spektrum Akademischer Verlag. 386 pp.; Zrzavy, J., D. Storch, and S. Mihulka. 2009. Evolution: ein Lese-Lehrbuch. Spektrum Akademischer Verlag. 493 pp			
Links				
Language of instruction	German			
Duration (semesters)	1 Semester			
Module frequency	jährlich			
Module capacity	unlimited			
Examination	Prüfungszeiten		Type of examination	
Final exam of module	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.	
Lehrveranstaltungsform	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		2	WiSe	28

Lehrveranstaltungsform	Comment	SWS	Frequency	Workload of compulsory attendance
Exercises		6	WiSe	84
Seminar		2	WiSe	28
Präsenzzeit Modul insgesamt				140 h

bio310 - General Ecology

Module label	General Ecology
Modulkürzel	bio310
Credit points	15.0 KP
Workload	450 h
Verwendbarkeit des Moduls	• Bachelor's Programme Biology (Bachelor) > Akzentsetzungsmodule • Dual-Subject Bachelor's Programme Biology (Bachelor) > Akzentsetzungsmodule • Master of Education Programme (Gymnasium) Biology (Master of Education) > Mastermodule
Zuständige Personen	• Hillebrand, Helmut (module responsibility) • Zotz, Gerhard (Module counselling) • Schupp, Peter (Module counselling) • Striebel, Maren (Module counselling) • Rohde, Sven (Module counselling) • Hillebrand, Helmut (Prüfungsberechtigt) • Zotz, Gerhard (Prüfungsberechtigt) • Schupp, Peter (Prüfungsberechtigt) • Striebel, Maren (Prüfungsberechtigt) • Rohde, Sven (Prüfungsberechtigt) • Fernandez-Mendez, Mar (Prüfungsberechtigt)
Prerequisites	Abschluss der Basismodule
Skills to be acquired in this module	++ biological knowledge ++ knowledge of biological working methods ++ biologically relevant knowledge in the natural sciences and mathematics + statistics & scientific programming + interdisciplinary knowledge & thinking ++ abstract, logical, analytical thinking + deepened expertise in biological specialist field + independent learning and (research-based) working + data presentation and evidence-based discussion (written and spoken) + (scientific) communication skills
Module contents	Vorlesung Allgemeine Ökologie: 2 SWS im Wintersemester (Theoretische Grundlagen, Ressourcen, Populationsökologie, biologische Interaktionen, Lebensgemeinschaften, Ökosysteme) Praktika/Seminare: 4 SWS im folgenden Sommersemester: Es sind 2 Praktika aus unterschiedlichen Praktikaangeboten zu wählen, z.B. • PR/S Vegetationsökologie / Naturschutz: Vegetationskundliche Aufnahmemethoden (Artenzusammensetzung, Struktur), Nährstoffverhältnisse des Oberbodens, Mikroklima, Naturschutzprojekte • PR/S Zoo-Ökologie: 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 • PR/SE Funktionelle Ökologie der Pflanzen: Analyse abiotischer Rahmenbedingungen (u.a. Mikroklima), Wasser-, Nährstoff-, Kohlenstoffhaushalt, Aspekte der Populationsbiologie, Analyse von Pflanzenbeständen (Struktur, Funktion), statistische Auswertung und Modellierung • PR/S Aquatische Ökologie: Experimentelle Analyse von Artwechselwirkungen, zum Beispiel Räuber-Beute und Konkurrenz. Experimentelles Design. Auswertung von Proben, Biomassebestimmungen, Auszählungen, Mikroskopie. Statistische Analyse. Schreiben unter wissenschaftlicher Publikationsnorm • PR/S Benthische Ökologie: Experimentelle Analyse abiotischer und biotischer Faktoren auf makrobenthische Organismen und Gemeinschaften. Salinitäts- und Temperatureinflüsse, Räuber-Beute Beziehungen, Konkurrenzeffekte, statistische Auswertung und Verfassung wissenschaftlicher Berichte. Gemeinsames Symposium zu den Praktikumsergebnissen (O-Woche des folgenden Wintersemesters), 4h.
Literaturempfehlungen	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

Links				
Language of instruction		German		
Duration (semesters)		2 Semester		
Module frequency		jährlich		
Module capacity		unlimited		
Examination	Prüfungszeiten		Type of examination	
Final exam of module	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
Präsenzzeit Modul insgesamt				140 h

bio325 - Pollination and Dispersal - Concepts

Module label	Pollination and Dispersal - Concepts			
Modulkürzel	bio325			
Credit points	6.0 KP			
Workload	180 h			
Verwendbarkeit des Moduls	• Bachelor's Programme Biology (Bachelor) > Akzentsetzungsmodule • Bachelor's Programme Mathematics (Bachelor) > Nebenfachmodule • Dual-Subject Bachelor's Programme Biology (Bachelor) > Akzentsetzungsmodule • Master of Education Programme (Gymnasium) Biology (Master of Education) > Mastermodule			
Zuständige Personen	• Albach, Dirk Carl (module responsibility) • von Hagen, Klaus Bernhard (Module counselling) • Will, Maria (Module counselling) • Albach, Dirk Carl (Prüfungsberechtigt) • von Hagen, Klaus Bernhard (Prüfungsberechtigt) • Will, Maria (Prüfungsberechtigt)			
Prerequisites	bio256 Flora and Fauna			
Skills to be acquired in this module	+ biological knowledge + knowledge of biological working methods + abstract, logical, analytical thinking + deepened expertise in biological specialist field + independent learning and (research-based) working + data presentation and evidence-based discussion (written and spoken) + teamwork + (scientific) communication skills + project and time management + knowledge of safety and environmental issues Extended knowledge of biodiversity and evolution of plants focusing on reproduction, dispersal, germination and establishment of plants			
Module contents	L: Pollination, dispersal, germination of plants, plant breeding S: Pollination and dispersal biology of plants in a systematic context			
Literatureempfehlungen	The course does not follow a special textbook. The following German literature is recommended to students interested in the course: Dieter Heß – Die Blüte, Eugen Ulmer Verlag as well as Leins & Erbar -Blüte und Frucht, Schweizerbart'sche Verlagsbuchhandlung.			
Links				
Language of instruction	German			
Duration (semesters)	1 Semester			
Module frequency	The module will be offered every other year			
Module capacity	12			
Examination	Prüfungszeiten		Type of examination	
Final exam of module			portfolio	
Lehrveranstaltungsform	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		2	SoSe	28
Seminar		2	SoSe	28
Präsenzzeit Modul insgesamt				56 h

bio326 - Pollination and Dispersal - Methods

Module label	Pollination and Dispersal - Methods	
Modulkürzel	bio326	
Credit points	6.0 KP	
Workload	180 h	
Verwendbarkeit des Moduls	• Bachelor's Programme Biology (Bachelor) > Akzentsetzungsmodule • Bachelor's Programme Mathematics (Bachelor) > Nebenfachmodule • Dual-Subject Bachelor's Programme Biology (Bachelor) > Akzentsetzungsmodule • Master of Education Programme (Gymnasium) Biology (Master of Education) > Mastermodule	
Zuständige Personen	• Albach, Dirk Carl (module responsibility) • von Hagen, Klaus Bernhard (Module counselling) • Will, Maria (Module counselling) • Albach, Dirk Carl (Prüfungsberechtigt) • von Hagen, Klaus Bernhard (Prüfungsberechtigt) • Will, Maria (Prüfungsberechtigt)	
Prerequisites	bio325 Pollination and dispersal concepts bio256 Flora/Fauna	
Skills to be acquired in this module	+ biological knowledge + knowledge of biological working methods + abstract, logical, analytical thinking + deepened expertise in biological specialist field + independent learning and (research-based) working + data presentation and evidence-based discussion (written and spoken) + teamwork + (scientific) communication skills + project and time management + knowledge of safety and environmental issues Extended knowledge of biodiversity and evolution of plants focusing on reproduction, dispersal, germination and establishment of plants	
Module contents	Pollination, fertilisation, dispersal and germination biological experiments in regard of adaptation to environmental factors	
Literatureempfehlungen	The course does not follow a special textbook. The following German literature is recommended to students interested in the course: Dieter Heß – Die Blüte, Eugen Ulmer Verlag as well as Leins & Erbar -Blüte und Frucht, Schweizerbart'sche Verlagsbuchhandlung.	
Links		
Language of instruction	German	
Duration (semesters)	1 Semester	
Module frequency	The module will be offered every other year	
Module capacity	12	
Examination	Prüfungszeiten	Type of examination
Final exam of module	Portfolio	
Lehrveranstaltungsform	Exercises	
SWS	4	
Frequency	SoSe	
Workload Präsenzzeit	56 h	

bio327 - Pollination and Dispersal - Methods not just for Schools

Module label	Pollination and Dispersal - Methods not just for Schools	
Modulkürzel	bio327	
Credit points	9.0 KP	
Workload	270 h	
Verwendbarkeit des Moduls	• Bachelor's Programme Biology (Bachelor) > Akzentsetzungsmodule • Bachelor's Programme Mathematics (Bachelor) > Nebenfachmodule • Dual-Subject Bachelor's Programme Biology (Bachelor) > Akzentsetzungsmodule • Master of Education Programme (Gymnasium) Biology (Master of Education) > Mastermodule	
Zuständige Personen	• Albach, Dirk Carl (module responsibility) • von Hagen, Klaus Bernhard (Module counselling) • Will, Maria (Module counselling) • Albach, Dirk Carl (Prüfungsberechtigt) • von Hagen, Klaus Bernhard (Prüfungsberechtigt) • Will, Maria (Prüfungsberechtigt)	
Prerequisites	bio325 Pollination and dispersal concepts bio256 Flora/fauna	
Skills to be acquired in this module	+ biological knowledge + knowledge of biological working methods + abstract, logical, analytical thinking + deepened expertise in biological specialist field + independent learning and (research-based) working + data presentation and evidence-based discussion (written and spoken) + teamwork + (scientific) communication skills + project and time management + knowledge of safety and environmental issues Extended knowledge of biodiversity and evolution of plants focusing on reproduction, dispersal, germination and establishment of plants	
Module contents	The module introduces methods to study pollination, fertilisation, dispersal and germination in regard of adaptation to environmental factors. Experiments applicable to school lessons will be presented and especially thoroughly discussed.	
Literaturempfehlungen	The course does not follow a special textbook. The following German literature is recommended to students interested in the course: Dieter Heß – Die Blüte, Eugen Ulmer Verlag as well as Leins & Erbar -Blüte und Frucht, Schweizerbart'sche Verlagsbuchhandlung.	
Links		
Language of instruction	German	
Duration (semesters)	1 Semester	
Module frequency	Das Modul findet alle zwei Jahre statt.	
Module capacity	12	
Examination	Prüfungszeiten	Type of examination
Final exam of module		portfolio
Lehrveranstaltungsform	Exercises	
SWS	6	
Frequency	SoSe	
Workload Präsenzzeit	84 h	

bio330 - Marine Ecology

Module label	Marine Ecology		
Modulkürzel	bio330		
Credit points	15.0 KP		
Workload	450 h		
Verwendbarkeit des Moduls	• Bachelor's Programme Biology (Bachelor) > Akzentsetzungsmodule • Dual-Subject Bachelor's Programme Biology (Bachelor) > Akzentsetzungsmodule • Master of Education Programme (Gymnasium) Biology (Master of Education) > Mastermodule		
Zuständige Personen	• Moorthi, Stefanie (Module counselling) • Hillebrand, Helmut (module responsibility) • Hillebrand, Helmut (Prüfungsberechtigt) • Moorthi, Stefanie (Prüfungsberechtigt)		
Prerequisites	Abschluss der Basismodule		
Skills to be acquired in this module	[nop] ++ biological knowledge ++ knowledge of biological working methods ++ biologically relevant knowledge in the natural sciences and mathematics + statistics & scientific programming + interdisciplinary knowledge & thinking ++ abstract, logical, analytical thinking ++ deepened expertise in biological specialist field ++ independent learning and (research-based) working ++ data presentation and evidence-based discussion (written and spoken) + teamwork ++ (scientific) communication skills + project and time management[/nop] Basic knowledge and practical experience in biological oceanography Apply theoretical concepts from different fields in marine ecology Analyse, present, and interpret results from the marine ecological literature and own investigations Acknowledge the importance of general ecological concepts for ecosystem management Gain experience in the application of field and lab methods in ecology		
Module contents	Lecture Biological Oceanography 2 SWS. Presence time 24 h, additional study time 66h, winter-term Abiotic environmental conditions in marine systems (light, temperature, chemical and physical proper-ties of the water, waves, tides, global distribution of water masses and currents. Pelagic communities, plankton (phyt-, zoo-, bacterio-, viroplankton), microbial loop, sedimentation, C- and N cycling, Nekton, Fisheries, El Nino, Benthic communities, estuaries. Exercise Concepts in marine ecology 6 SWS. Presence time 70 h, additional study time 200h, winter-term Practical and theoretical exercises on marine ecology, including field studies, experiments and working with case studies from the literature. The focus is on concepts here, pinpointing at general ecological frameworks. Lecture Marine Ecology 2 SWS. Presence time 24 h, additional study time 66h, winter-term Ecology of marine systems: estuaries, rocky and sediment coasts, pelagial, shelves, mangroves, seagrass meadows, coral reefs, deep sea, polar regions. The focus is on ecological specifics and interactions in the biotic communities of these systems. The second half of the lecture will focus on importance and consequences of overfishing, habitat destruction, pollution, climate change and bioinvasion on marine systems.		
Literatureempfehlungen	C.M. Lalli, T.R. Parsons, Biological Oceanography: An Introduction, Elsevier, Oxford. U. Sommer, Biologische Meereskunde, Springer Verlag, Heidelberg.		
Links			
Language of instruction	German		
Duration (semesters)	2 Semester		
Module frequency	jährlich		
Module capacity	unlimited		
Examination	Prüfungszeiten	Type of examination	
Final exam of module	Written exam at the end of the Lecture Marine Ecology	1 written exam (Lecture) (50%), 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.	
Lehrveranstaltungsform	Comment	SWS	Frequency
Lecture		4	56
Exercises		6	84
Präsenzzeit Modul insgesamt			140 h

bio340 - Morphology, Phylogeny, and Evolution of Metazoa

Module label	Morphology, Phylogeny, and Evolution of Metazoa			
Modulkürzel	bio340			
Credit points	15.0 KP			
Workload	450 h			
Verwendbarkeit des Moduls	• Bachelor's Programme Biology (Bachelor) > Akzentsetzungsmodule • Dual-Subject Bachelor's Programme Biology (Bachelor) > Akzentsetzungsmodule • Master of Education Programme (Gymnasium) Biology (Master of Education) > Mastermodule			
Zuständige Personen	• Bininda-Emonds, Olaf (module responsibility) • Ahlrichs, Wilko (Module counselling) • Bininda-Emonds, Olaf (Prüfungsberechtigt) • Ahlrichs, Wilko (Prüfungsberechtigt)			
Prerequisites	Abschluss der Basismodule			
Skills to be acquired in this module	++ biological knowledge + knowledge of biological working methods ++ biologically relevant knowledge in the natural sciences and mathematics + statistics & scientific programming + interdisciplinary knowledge & thinking + abstract, logical, analytical thinking ++ deepened expertise in biological specialist field + independent learning and (research-based) working ++ data presentation and evidence-based discussion (written and spoken) + teamwork ++ (scientific) communication skills + project and time management Upon successful completion of the module the students will gain: 1. a survey of topical subjects relating to the morphology and phylogeny of animals, 2. a thorough knowledge of the development of morphological characteristics, 3. technical skills in studying morphological structures, and 4. knowledge into recent hypotheses on the phylogeny of animals.			
Module contents	Lecture: Details regarding the morphology and evolution of Metazoa from an explicit phylogenetic framework Seminar: Presentation and discussion of recent subjects and issues relating to the evolution of Metazoa; presentation of individual metazoan taxa Exercise: Preparation and documentation of exemplary species of Metazoa; various field studies (e.g. visit to the Dierenpark Emmen or to the Zoo am Meer (Bremerhaven), sampling aquatic micrometazoans, observing birds)			
Literatureempfehlungen	Relevant literature will be announced during the first seminar and is contingent on the latest developments in the research field.			
Links				
Language of instruction	German			
Duration (semesters)	1 Semester			
Module frequency	jährlich			
Module capacity	unlimited			
Examination	Prüfungszeiten	Type of examination		
Final exam of module	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.		
Lehrveranstaltungsform	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		2		28
Exercises		5		70
Seminar		2		28
Präsenzzeit Modul insgesamt				126 h

bio355 - Microscopical Anatomy

Module label	Microscopical Anatomy			
Modulkürzel	bio355			
Credit points	9.0 KP			
Workload	270 h			
Verwendbarkeit des Moduls	• Bachelor's Programme Biology (Bachelor) > Akzentsetzungsmodule • Bachelor's Programme Mathematics (Bachelor) > Nebenfachmodule • Dual-Subject Bachelor's Programme Biology (Bachelor) > Akzentsetzungsmodule • Master of Education Programme (Gymnasium) Biology (Master of Education) > Mastermodule			
Zuständige Personen	• Ahlrichs, Wilko (module responsibility) • Kieneke, Alexander (Module counselling) • Hoppenrath, Mona (Module counselling) • Ahlrichs, Wilko (Prüfungsberechtigt) • Hoppenrath, Mona (Prüfungsberechtigt) • Kieneke, Alexander (Prüfungsberechtigt)			
Prerequisites	Abschluss der Basismodule			
Skills to be acquired in this module	++ biological knowledge ++ knowledge of biological working methods ++ biologically relevant knowledge in the natural sciences and mathematics + interdisciplinary knowledge & thinking ++ abstract, logical, analytical thinking ++ deepened expertise in biological specialist field ++ independent learning and (research-based) working ++ data presentation and evidence-based discussion (written and spoken) + teamwork ++ (scientific) communication skills + project and time management + knowledge of safety and environmental issues This course is designed for students to learn about the basic light and electron optical methods. Students will be able to work with preparative techniques for scanning electron microscopy, 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.			
Module contents	Microscopy of protists and micro metazoans. Students are required plan and carry out a research project that exposes them to some of the challenges and problems encountered by microscopical 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.			
Literatureempfehlungen	Will be announced in the course.			
Links				
Language of instruction	German			
Duration (semesters)	1 Semester			
Module frequency	annually			
Module capacity	8 (For more applicants than places, a motivation letter decides on the admission.)			
Examination	Prüfungszeiten	Type of examination		
Final exam of module	end of module	portfolio		
Lehrveranstaltungsform	Comment	SWS	Frequency	Workload of compulsory attendance
Vorlesung und Seminar		2	WiSe	28

Lehrveranstaltungsform	Comment	SWS	Frequency	Workload of compulsory attendance
Exercises		3.5	WiSe	49
Präsenzzeit Modul insgesamt				77 h

bio360 - Marine Biodiversity

Module label	Marine Biodiversity
Modulkürzel	bio360
Credit points	15.0 KP
Workload	450 h
Verwendbarkeit des Moduls	• Bachelor's Programme Biology (Bachelor) > Akzentsetzungsmodule • Dual-Subject Bachelor's Programme Biology (Bachelor) > Akzentsetzungsmodule • Master of Education Programme (Gymnasium) Biology (Master of Education) > Mastermodule
Zuständige Personen	• Martinez Arbizu, Pedro Miguel (module responsibility) • Hoppenrath, Mona (Module counselling) • Martinez Arbizu, Pedro Miguel (Prüfungsberechtigt) • Hoppenrath, Mona (Prüfungsberechtigt) • Wehrmann, Achim (Prüfungsberechtigt)
Prerequisites	Abschluss der Basismodule
Skills to be acquired in this module	++ biological knowledge ++ knowledge of biological working methods + interdisciplinary knowledge & thinking + abstract, logical, analytical thinking ++ deepened expertise in biological specialist field ++ independent learning and (research-based) working ++ data presentation and evidence-based discussion (written and spoken) + teamwork + (scientific) communication skills + project and time management By active participation the students acquire the following knowledge/abilities/qualification: * Preparation and organization of sampling * Keeping organisms – field study * Marine deposits, development of marine sediments and their effects on the fauna * Methods of meiofauna and macrofauna sampling, also plankton sampling * Methods of quantitative community analysis * Diversity comparison of various sites applying statistical methods * Multivariate statistics for correlation of biocenoses and environmental variables * Biocenoses of marine habitats * Biology, morphology, systematics, behaviour and ecology of selected taxa in marine water systems * Formulation and definition of scientific questions and selection of methods * Habitat and biocenoses, interstitial, littoral (lotic, lenitic), diversity * Planning behavioural experiments * Presentation and discussion of scientific results * Independent scientific work in groups and presentation of results
Module contents	The module gives an introduction to marine biodiversity research demonstrated by various animal groups from the Wadden Sea and the North Sea including independent sampling on the coast and on the islands. The students will collect the organisms in the field or on board using sampling equipment. In the laboratory course, the biology and morphology as well as the ecology and behaviour of certain species are investigated and documented. The morphology of marine sediments and their development are further aspects of this module.
Literaturempfehlungen	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				
Language of instruction		German		
Duration (semesters)		1 Semester		
Module frequency		jährlich		
Module capacity		unlimited		
Examination		Prüfungszeiten	Type of examination	
Final exam of module		During lectures	1 Portfolio	
PLEASE NOTE: Additional conditions regarding attendance and ungraded activities as determined by the persons responsible for the module will apply.				
Lehrveranstaltungsform	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		2		28
Exercises		9		126
Seminar		2		28
Präsenzzeit Modul insgesamt				182 h

bio375 - Flora - Advanced Concepts

Module label	Flora - Advanced Concepts			
Modulkürzel	bio375			
Credit points	6.0 KP			
Workload	180 h			
Verwendbarkeit des Moduls	• Bachelor's Programme Biology (Bachelor) > Akzentsetzungsmodule • Bachelor's Programme Mathematics (Bachelor) > Nebenfachmodule • Dual-Subject Bachelor's Programme Biology (Bachelor) > Akzentsetzungsmodule • Master of Education Programme (Gymnasium) Biology (Master of Education) > Mastermodule			
Zuständige Personen	• Albach, Dirk Carl (module responsibility) • von Hagen, Klaus Bernhard (Module counselling) • Will, Maria (Module counselling) • Albach, Dirk Carl (Prüfungsberechtigt) • von Hagen, Klaus Bernhard (Prüfungsberechtigt) • Will, Maria (Prüfungsberechtigt)			
Prerequisites	bio256 Flora and Fauna			
Skills to be acquired in this module	+ biological knowledge + knowledge of biological working methods + deepened expertise in biological specialist field + independent learning and (research-based) working + data presentation and evidence-based discussion (written and spoken) + (scientific) communication skills + knowledge of safety and environmental issues The module is intended to give students in-depth knowledge on plant determination and the diversity of plants. Students shall increase their knowledge on species and learn and improve their abilities in plant determination and plant conservation. Subjects and methods relevant for nature conservation are emphasized. Along with these, students shall improve their systemic thinking with relation to nature in northwestern Germany and its flora. Students learn about plants and how to group them according to their phylogeny and evolutionary adaptations, so they can pass this knowledge on to others. Competence in assessment is conveyed in the areas of diversity and natuer conservation to sensibelize students for a respectful treatment of nature and passing on this ability to others. Finally, we will discuss sustainable use of plants and habitats and their restoration.			
Module contents	The module comprises a lecture in the Botanical Garden, where plants will be observed and investigated. This includes algae, bryophytes, ferns, gymnosperms and various families of angiosperms. The seminar is intended to let students study in-depth additional plant families with their typical characters.			
Literatureempfehlungen	Rothmaler - Exkursionsflora von Deutschland. Gefäßpflanzen: Grundband			
Links				
Language of instruction	German			
Duration (semesters)	1 Semester			
Module frequency	The module will be offered every other year			
Module capacity	12			
Examination	Prüfungszeiten		Type of examination	
Final exam of module			portfolio	
Lehrveranstaltungsform	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		2	SoSe	28
Seminar		2	SoSe	28
Präsenzzeit Modul insgesamt	56 h			

bio376 - Flora - Advanced Methods

Module label	Flora - Advanced Methods	
Modulkürzel	bio376	
Credit points	6.0 KP	
Workload	180 h	
Verwendbarkeit des Moduls	• Bachelor's Programme Biology (Bachelor) > Akzentsetzungsmodule • Bachelor's Programme Mathematics (Bachelor) > Nebenfachmodule • Dual-Subject Bachelor's Programme Biology (Bachelor) > Akzentsetzungsmodule • Master of Education Programme (Gymnasium) Biology (Master of Education) > Mastermodule	
Zuständige Personen	• Albach, Dirk Carl (module responsibility) • von Hagen, Klaus Bernhard (Module counselling) • Will, Maria (Module counselling) • Albach, Dirk Carl (Prüfungsberechtigt) • von Hagen, Klaus Bernhard (Prüfungsberechtigt) • Will, Maria (Prüfungsberechtigt)	
Prerequisites	bio256 Flora and Fauna bio375 Flora - Advanced concepts	
Skills to be acquired in this module	+ biological knowledge + knowledge of biological working methods + deepened expertise in biological specialist field + independent learning and (research-based) working + data presentation and evidence-based discussion (written and spoken) + (scientific) communication skills + knowledge of safety and environmental issues The module is intended to give students in-depth knowledge on plant determination and the diversity of plants. Students shall increase their knowledge on species and learn and improve their abilities in plant determination and plant conservation. Subjects and methods relevant for nature conservation are emphasized. Along with these, students shall improve their systemic thinking with relation to nature in northwestern Germany and its flora. Students learn about plants and how to group them according to their phylogeny and evolutionary adaptations, so they can pass this knowledge on to others. Competence in assessment is conveyed in the areas of diversity and nature conservation to 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.	
Module contents	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.	
Literatureempfehlungen	Rothmaler - Exkursionsflora von Deutschland. Gefäßpflanzen: Grundband	
Links		
Language of instruction	German	
Duration (semesters)	1 Semester	
Module frequency	The module will be offered every other year	
Module capacity	12	
Examination	Prüfungszeiten	Type of examination
Final exam of module		portfolio
Lehrveranstaltungsform	Exercises	
SWS	4	
Frequency	SoSe	
Workload Präsenzzeit	56 h	

bio377 - Flora - Advanced Methods not just for schools

Module label	Flora - Advanced Methods not just for schools	
Modulkürzel	bio377	
Credit points	9.0 KP	
Workload	270 h	
Verwendbarkeit des Moduls	• Bachelor's Programme Biology (Bachelor) > Akzentsetzungsmodule • Bachelor's Programme Mathematics (Bachelor) > Nebenfachmodule • Dual-Subject Bachelor's Programme Biology (Bachelor) > Akzentsetzungsmodule • Master of Education Programme (Gymnasium) Biology (Master of Education) > Mastermodule	
Zuständige Personen	• Albach, Dirk Carl (module responsibility) • von Hagen, Klaus Bernhard (Module counselling) • Will, Maria (Module counselling) • Albach, Dirk Carl (Prüfungsberechtigt) • von Hagen, Klaus Bernhard (Prüfungsberechtigt) • Will, Maria (Prüfungsberechtigt)	
Prerequisites	bio375 Flora - Advanced Concepts bio256 Flora and Fauna	
Skills to be acquired in this module	+ biological knowledge + knowledge of biological working methods + deepened expertise in biological specialist field + independent learning and (research-based) working + data presentation and evidence-based discussion (written and spoken) + (scientific) communication skills + knowledge of safety and environmental issues The module is intended to give students in-depth knowledge on plant determination and the diversity of plants. Students shall increase their knowledge on species and learn and improve their abilities in plant determination and plant conservation. Subjects and methods relevant for nature conservation are emphasized. Along with these, students shall improve their systemic thinking with relation to nature in northwestern Germany and its flora. Students learn about plants and how to group them according to their phylogeny and evolutionary adaptations, so they can pass this knowledge on to others. Competence in assessment is conveyed in the areas of diversity and nature conservation to 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.	
Module contents	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.	
Literatureempfehlungen	Rothmaler - Exkursionsflora von Deutschland. Gefäßpflanzen: Grundband	
Links		
Language of instruction	German	
Duration (semesters)	1 Semester	
Module frequency	The module will be offered every other year	
Module capacity	12	
Examination	Prüfungszeiten	Type of examination
Final exam of module		portfolio
Lehrveranstaltungsform	Exercises	
SWS	6	
Frequency	SoSe	
Workload Präsenzzeit	84 h	

bio385 - Specific Microbiology

Module label	Specific Microbiology			
Modulkürzel	bio385			
Credit points	12.0 KP			
Workload	360 h			
Verwendbarkeit des Moduls	• Bachelor's Programme Biology (Bachelor) > Akzentsetzungsmodule • Dual-Subject Bachelor's Programme Biology (Bachelor) > Akzentsetzungsmodule • Master of Education Programme (Gymnasium) Biology (Master of Education) > Mastermodule			
Zuständige Personen	• Rabus, Ralf Andreas (module responsibility) • Rabus, Ralf Andreas (Prüfungsberechtigt) • Wünsch, Daniel (Prüfungsberechtigt)			
Prerequisites	bio233 Basics in microbiology and genetics bio265 general microbiology			
Skills to be acquired in this module	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			
Module contents	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			
Literaturempfehlungen	Schmauder HP (1994) Methoden der Biotechnologie, Kapitel 3.2.2. Gustav Fischer Verlag Jena Chmiel H, Briechele S (1991) Bioprozesstechnik. Gustav Fischer Verlag Stuttgart			
Links	www.icbm.de/ammb			
Language of instruction	German			
Duration (semesters)	1 Semester			
Module frequency	jährlich			
Module capacity	8			
Examination	Prüfungszeiten		Type of examination	
Final exam of module			exam (50%) protocol (50%)	
Lehrveranstaltungsform	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		2	WiSe	28
Seminar		2	WiSe	28
Practical training		6	WiSe	84
Präsenzzeit Modul insgesamt				140 h

bio405 - Introduction to Neurobiology I

Module label	Introduction to Neurobiology I			
Modulkürzel	bio405			
Credit points	12.0 KP			
Workload	360 h			
Verwendbarkeit des Moduls	• Bachelor's Programme Biology (Bachelor) > Akzentsetzungsmodule • Bachelor's Programme Mathematics (Bachelor) > Nebenfachmodule • Dual-Subject Bachelor's Programme Biology (Bachelor) > Akzentsetzungsmodule • Master of Education Programme (Gymnasium) Biology (Master of Education) > Mastermodule			
Zuständige Personen	• Greschner, Martin (module responsibility) • Koch, Karl-Wilhelm (Module counselling) • Janssen-Bienhold, Ulrike (Module counselling) • Janssen-Bienhold, Ulrike (Prüfungsberechtigt) • Greschner, Martin (Prüfungsberechtigt) • Koch, Karl-Wilhelm (Prüfungsberechtigt) • Köppl, Christine (Prüfungsberechtigt) • Dömer, Patrick (Prüfungsberechtigt)			
Prerequisites	Abschluss der Basismodule			
Skills to be acquired in this module	++ deepened biological expertise ++ deepened knowledge of biological working methods + scientific/mathematical basic knowledge relevant for biology + critical and analytical thinking ++ data presentation and discussion in German (written and spoken) + teamwork			
Module contents	The lecture covers the molecular and cellular basis of neurobiology, the electrical properties of nerve cells, the organization and development of the nervous system and the function of the motor system. In the seminar, topics related to the lectures of the week are covered in more depth. In the exercises, the theoretical knowledge from the lectures will be tested in small experiments.			
Literatureempfehlungen	Purves D. et al.: Neuroscience, Sinauer Associates, Sunderland USA, latest edition			
Links				
Language of instruction	German			
Duration (semesters)	1 Semester			
Module frequency	annually			
Module capacity	30			
Reference text	associated with the modules bio415 and bio416 Introduction to Neurobiology II in the winter semester			
Examination	Prüfungszeiten		Type of examination	
Final exam of module	end of semester		exam and protocol	
Lehrveranstaltungsform	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		3	SoSe	42
Seminar		1	SoSe	14
Exercises		4	SoSe	56
Tutorial (optional)			SoSe und WiSe	0
Präsenzzeit Modul insgesamt	112 h			

bio415 - Introduction to Neurobiology II

Module label	Introduction to Neurobiology II			
Modulkürzel	bio415			
Credit points	6.0 KP			
Workload	180 h			
Verwendbarkeit des Moduls	• Bachelor's Programme Biology (Bachelor) > Akzentsetzungsmodule • Bachelor's Programme Mathematics (Bachelor) > Nebenfachmodule • Dual-Subject Bachelor's Programme Biology (Bachelor) > Akzentsetzungsmodule • Master of Education Programme (Gymnasium) Biology (Master of Education) > Mastermodule			
Zuständige Personen	• Greschner, Martin (module responsibility) • Thiel, Christiane Margarete (Module counselling) • Köppl, Christine (Module counselling) • Greschner, Martin (Prüfungsberechtigt) • Thiel, Christiane Margarete (Prüfungsberechtigt) • Köppl, Christine (Prüfungsberechtigt)			
Prerequisites	Abschluss der Basismodule			
Skills to be acquired in this module	++ deepened biological expertise ++ deepened knowledge of biological working methods + scientific/mathematical basic knowledge relevant for biology + critical and analytical thinking			
Module contents	The lecture covers the basics of systemic neuroscience with a focus on proprocessing in sensory systems, the plasticity of the nervous system and the mechanisms underlying cognitive pro-cessing. In the seminar, topics related to the lectures of the week are covered in more depth.			
Literatureempfehlungen	Purves D. et al.: Neuroscience, Sinauer Associates, Sunderland USA, latest edition			
Links				
Language of instruction	German			
Duration (semesters)	1 Semester			
Module frequency	Wintersemester			
Module capacity	30			
Examination	Prüfungszeiten		Type of examination	
Final exam of module	end of semester		written exam	
Lehrveranstaltungsform	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		3	WiSe	42
Seminar		1	WiSe	14
Präsenzzeit Modul insgesamt				56 h

bio420 - Biochemistry of the Cell

Module label	Biochemistry of the Cell			
Modulkürzel	bio420			
Credit points	6.0 KP			
Workload	180 h			
Verwendbarkeit des Moduls	• Bachelor's Programme Biology (Bachelor) > Akzentsetzungsmodule • Dual-Subject Bachelor's Programme Biology (Bachelor) > Akzentsetzungsmodule • Master of Education Programme (Gymnasium) Biology (Master of Education) > Mastermodule			
Zuständige Personen	• Scholten, Alexander (module responsibility) • Scholten, Alexander (Prüfungsberechtigt)			
Prerequisites	Abschluss der Basismodule			
Skills to be acquired in this module	++ biological knowledge + knowledge of biological working methods + biologically relevant knowledge in the natural sciences and mathematics + abstract, logical, analytical thinking + data presentation and evidence-based discussion (written and spoken) ++ (scientific) communication skills			
Module contents	supramolecular organization in the cell, interactions of biomolecules, signalling fluxes			
Literatureempfehlungen	Biochemie, Müller-Esterl Biochemie, Lubert Stryer Lehninger Prinzipien der Biochemie, David L. Nelson und Michael M. Cox Principles of Biochemistry, Horton et al.			
Links				
Language of instruction	German			
Duration (semesters)	1 Semester			
Module frequency	annually			
Module capacity	20			
Examination	Prüfungszeiten		Type of examination	
Final exam of module	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
Präsenzzeit Modul insgesamt				56 h

bio430 - Analytical Biochemistry

Module label	Analytical Biochemistry			
Modulkürzel	bio430			
Credit points	6.0 KP			
Workload	180 h			
Verwendbarkeit des Moduls	• Bachelor's Programme Biology (Bachelor) > Akzentsetzungsmodule • Dual-Subject Bachelor's Programme Biology (Bachelor) > Akzentsetzungsmodule • Master of Education Programme (Gymnasium) Biology (Master of Education) > Mastermodule			
Zuständige Personen	• Koch, Karl-Wilhelm (module responsibility) • Scholten, Alexander (Module counselling) • Koch, Karl-Wilhelm (Prüfungsberechtigt) • Scholten, Alexander (Prüfungsberechtigt)			
Prerequisites	Abschluss der Basismodule			
Skills to be acquired in this module	++ biological knowledge ++ knowledge of biological working methods + biologically relevant knowledge in the natural sciences and mathematics + abstract, logical, analytical thinking + deepened expertise in biological specialist field ++ data presentation and evidence-based discussion (written and spoken) + teamwork The students get a survey of current techniques in Biochemistry and learn some essential techniques such as column chromatography and enzyme kinetic measurements in practice. They understand the theoretical fundamentals of these techniques and assess experimentally collected data bases.			
Module contents	Bioanalytical methods in theory and practice			
Literatureempfehlungen	Bioanalytik, Lottspeich/Engels			
Links				
Language of instruction	German			
Duration (semesters)	1 Semester			
Module frequency	annually			
Module capacity	20			
Examination	Prüfungszeiten		Type of examination	
Final exam of module	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
Präsenzzeit Modul insgesamt				56 h

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

Module label	Microfauna, Mircoflora & Protista of limnic and marine habitats
Modulkürzel	bio440
Credit points	6.0 KP
Workload	180 h
Verwendbarkeit des Moduls	• Bachelor's Programme Biology (Bachelor) > Akzentsetzungsmodule • Dual-Subject Bachelor's Programme Biology (Bachelor) > Akzentsetzungsmodule • Master of Education Programme (Gymnasium) Biology (Master of Education) > Mastermodule
Zuständige Personen	• Ahlrichs, Wilko (module responsibility) • Kieneke, Alexander (Module counselling) • Hoppenrath, Mona (Module counselling) • Ahlrichs, Wilko (Prüfungsberechtigt) • Kieneke, Alexander (Prüfungsberechtigt) • Hoppenrath, Mona (Prüfungsberechtigt)
Prerequisites	Abschluss der Basismodule
Skills to be acquired in this module	++ biological knowledge ++ knowledge of biological working methods ++ biologically relevant knowledge in the natural sciences and mathematics + statistics & scientific programming ++ interdisciplinary knowledge & thinking + abstract, logical, analytical thinking ++ deepened expertise in biological specialist field ++ independent learning and (research-based) working ++ data presentation and evidence-based discussion (written and spoken) + teamwork ++ (scientific) communication skills + project and time management The objectives of the module are the teaching and learning of methods in the field of taxonomy, systematics, morphology, ecology, and evolution. 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. The focus is on taxa of the microfauna and protists of limnic and marine habitats. The goal is the knowledge of biotic and abiotic properties of aquatic habitats, their formation and biodiversity. The students should learn to hypothesize structural adaptations of organisms to aquatic habitats.
Module contents	We study microfauna and protists of limnic and marine habitats. Microfauna refers to microscopic animals. They live together with protists aquatic habitats in high diversity. Animals of the microfauna and protists usually belong to groups that developed early in evolution. The study of communities of these groups give a unique insight into the evolution of animals and protists. The microfauna and the protists are little studied compared to other groups of animals and offer great potential. But they must be examined under the optical microscope. This requires special techniques and knowledge. Fortunately, through digital techniques, the investigation and publications have been greatly simplified. We will make excursions to ponds, ponds, lakes, rivers, bogs, sea beaches, etc. It teaches where, when, and how to find species of microfauna and protists. The collected organisms are determined, prepared, microscoped, photographed, drawn, and digitally illustrated. Art descriptions are produced. Attention is paid to the correct application of nomenclature rules. We show how a scientific collection is built and managed. For this purpose, basic knowledge in SQL database technology is taught. Dichotomous, synoptic, and digital identification keys are presented and developed. In addition to the classical morphological methods, it will be shown how species for molecular barcoding and phylogenetic analyzes are investigated. The students will create art portraits. The results are communicated in the form of posters, short lectures, and scientific publications.
Literatureempfehlungen	Will be announced in the course.
Links	
Language of instruction	German

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

bio450 - Posters, Pictures, Presentations and Papers

Module label	Posters, Pictures, Presentations and Papers	
Modulkürzel	bio450	
Credit points	9.0 KP	
Workload	270 h	
Verwendbarkeit des Moduls	• Bachelor's Programme Biology (Bachelor) > Akzentsetzungsmodule • Dual-Subject Bachelor's Programme Biology (Bachelor) > Akzentsetzungsmodule • Master of Education Programme (Gymnasium) Biology (Master of Education) > Mastermodule	
Zuständige Personen	• Bininda-Emonds, Olaf (module responsibility) • Ahlrichs, Wilko (Module counselling) • Bininda-Emonds, Olaf (Prüfungsberechtigt) • Ahlrichs, Wilko (Prüfungsberechtigt)	
Prerequisites	Abschluss der Basismodule	
Skills to be acquired in this module	+ interdisciplinary knowledge & thinking + abstract, logical, analytical thinking + deepened expertise in biological specialist field ++ independent learning and (research-based) working ++ data presentation and evidence-based discussion (written and spoken) ++ (scientific) communication skills + project and time management Practical experience with four forms of scientific presentation: papers, presentations, scientific drawings, and posters. The students will learn / gain: 1) the logical and structural form of a scientific paper (or protocol or thesis) so as to communicate their results more effectively; 2) the distillation of the key information out of a project and its focused presentation in a lecture or poster; 3) experience with constructive criticism in a group setting as well as the critical assessment of scientific studies; 4) experience with scientific English; and 5) the art of scientific drawing, including the making of high-quality photo montages for papers or posters through microphotography and digital editing.	
Module contents	Theoretical part: General tips regarding the logical and structural form of a scientific paper, presentation, or posters, including how to avoid making the most common mis-takes. 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).	
Literatureempfehlungen	None. The relevant scientific literature will be distributed during the course.	
Links		
Languages of instruction	German, English	
Duration (semesters)	1 Semester	
Module frequency	annually	
Module capacity	10 (Letter of motivation)	
Examination	Prüfungszeiten	Type of examination
Final exam of module		Portfolio (100%)
Lehrveranstaltungsform	Exercises	
SWS	6	
Frequency	SoSe	
Workload Präsenzzeit	84 h	

bio470 - Marine Biology Field Trip

Module label	Marine Biology Field Trip			
Modulkürzel	bio470			
Credit points	6.0 KP			
Workload	180 h			
Verwendbarkeit des Moduls	• Bachelor's Programme Biology (Bachelor) > Akzentsetzungsmodule • Dual-Subject Bachelor's Programme Biology (Bachelor) > Akzentsetzungsmodule • Master of Education Programme (Gymnasium) Biology (Master of Education) > Mastermodule			
Zuständige Personen	• Ahlrichs, Wilko (module responsibility) • Kieneke, Alexander (Module counselling) • Ahlrichs, Wilko (Prüfungsberechtigt) • Kieneke, Alexander (Prüfungsberechtigt)			
Prerequisites	Abschluss der Basismodule			
Skills to be acquired in this module	[nop] ++ biological knowledge ++ knowledge of biological working methods ++ biologically relevant knowledge in the natural sciences and mathematics + statistics & scientific programming + interdisciplinary knowledge & thinking + abstract, logical, analytical thinking ++ deepened expertise in biological specialist field ++ independent learning and (research-based) working ++ data presentation and evidence-based discussion (written and spoken) + teamwork ++ (scientific) communication skills + project and time management[/nop] Objective of the module/skills: 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.			
Module contents	Content of the module: 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.			
Literaturempfehlungen	Will be announced in Stud.IP.			
Links				
Language of instruction	German			
Duration (semesters)	1 Semester			
Module frequency	annually			
Module capacity	14 (For more applicants than places, a letter of motivation decides on the admission.)			
Reference text	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	
Final exam of module	Modulende		1 portfolio	
Lehrveranstaltungsform	Comment	SWS	Frequency	Workload of compulsory attendance
Seminar		2	SoSe	28
Exercises		2	SoSe	28
Study trip		2	SoSe	28
Präsenzzeit Modul insgesamt				84 h

bio480 - Functional Morphology of Plants

Module label	Functional Morphology of Plants			
Modulkürzel	bio480			
Credit points	6.0 KP			
Workload	180 h			
Verwendbarkeit des Moduls	• Bachelor's Programme Biology (Bachelor) > Akzentsetzungsmodule • Dual-Subject Bachelor's Programme Biology (Bachelor) > Akzentsetzungsmodule • Master of Education Programme (Gymnasium) Biology (Master of Education) > Mastermodule			
Zuständige Personen	• Zotz, Gerhard (module responsibility) • Einzmann, Helena (Module counselling) • Zotz, Gerhard (Prüfungsberechtigt) • Einzmann, Helena (Prüfungsberechtigt)			
Prerequisites	Abschluss der Basismodule			
Skills to be acquired in this module	++ biological knowledge + knowledge of biological working methods + biologically relevant knowledge in the natural sciences and mathematics + interdisciplinary knowledge & thinking + abstract, logical, analytical thinking ++ deepened expertise in biological specialist field + independent learning and (research-based) working 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			
Module contents	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)			
Literatureempfehlungen	Kadereit JW, et al (2014) Strasburger Lehrbuch der Botanik. 37. Aufl. Spektrum Akademischer Verlag Eschrich, W. (1995) Funktionelle Pflanzenanatomie. Springer			
Links				
Language of instruction	German			
Duration (semesters)	1 Semester			
Module frequency	annually			
Module capacity	8			
Examination	Prüfungszeiten		Type of examination	
Final exam of module			1 Portfolio (oral presentation and 1 report) OR 1 Written examination	
Lehrveranstaltungsform	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		1	WiSe	14
Seminar		1	WiSe	14
Exercises		2	WiSe	28
Präsenzzeit Modul insgesamt				56 h

Ergänzungsmodule

bio150 - Statistics for Biologists

Module label	Statistics for Biologists			
Modulkürzel	bio150			
Credit points	6.0 KP			
Workload	180 h			
Verwendbarkeit des Moduls	- Bachelor's Programme Biology (Bachelor) > Naturwissenschaftliche Grundlagen - Dual-Subject Bachelor's Programme Biology (Bachelor) > Ergänzungsmodule			
Zuständige Personen	- Kretzberg, Jutta (module responsibility) - Kretzberg, Jutta (Prüfungsberechtigt)			
Prerequisites				
Skills to be acquired in this module	[nop] + knowledge of biological working methods ++ biologically relevant knowledge in the natural sciences and mathematics ++ statistics & scientific programming + interdisciplinary knowledge & thinking ++ abstract, logical, analytical thinking + independent learning and (research-based) working + data presentation and evidence-based discussion (written and spoken) + teamwork [/nop] Knowledge in applied statistics Basic knowledge of programming language R Ability to plan, conduct and interpret statistical analysis of biological data			
Module contents	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			
Literatureempfehlungen	A detailed script for lecture and exercises is available in Stud.IP			
Links				
Language of instruction	German			
Duration (semesters)	1 Semester			
Module frequency	jährlich			
Module capacity	unlimited			
Reference text	Übungen mit R können auf einem eigenen Laptop oder im Rechnerraum absolviert werden			
Type of module	je nach Studiengang Pflicht oder Wahlpflicht			
Module level	---			
Examination	Prüfungszeiten		Type of examination	
Final exam of module	within two weeks after lecture time		written exam (+15% bonus points from exercises)	
Lehrveranstaltungsform	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		2	SoSe	28
Exercises		2	SoSe	28
Präsenzzeit Modul insgesamt				56 h

bio251 - Exercises in Biochemistry and Molecular Biology

Module label	Exercises in Biochemistry and Molecular Biology			
Modulkürzel	bio251			
Credit points	6.0 KP			
Workload	180 h			
Verwendbarkeit des Moduls	• Bachelor's Programme Biology (Bachelor) > Naturwissenschaftliche Grundlagen • Dual-Subject Bachelor's Programme Biology (Bachelor) > Ergänzungsmodule			
Zuständige Personen	• Scholten, Alexander (module responsibility) • Nolte, Arne (Module counselling) • Scholten, Alexander (Prüfungsberechtigt) • Nolte, Arne (Prüfungsberechtigt)			
Prerequisites	admission of BSc students in Biology			
Skills to be acquired in this module	++ biological knowledge ++ knowledge of biological working methods + biologically relevant knowledge in the natural sciences and mathematics + abstract, logical, analytical thinking + data presentation and evidence-based discussion (written and spoken) + teamwork + knowledge of safety and environmental issues			
Module contents	General introduction to principles of laboratory work in Biochemistry and Cell Biology			
Literatureempfehlungen	Script			
Links				
Language of instruction	German			
Duration (semesters)	1 Semester			
Module frequency				
Module capacity	unlimited			
Examination	Prüfungszeiten		Type of examination	
Final exam of module	during semester		written exam; additionally ungraded protocols	
Lehrveranstaltungsform	Comment	SWS	Frequency	Workload of compulsory attendance
Seminar		1	SoSe	14
Exercises		3	SoSe	42
Präsenzzeit Modul insgesamt				56 h

che101 - Basic Chemistry

Module label	Basic Chemistry		
Modulkürzel	che101		
Credit points	6.0 KP		
Workload	180 h		
Verwendbarkeit des Moduls	• Bachelor's Programme Biology (Bachelor) > Naturwissenschaftliche Grundlagen • Bachelor's Programme Mathematics (Bachelor) > Nebenfachmodule • Dual-Subject Bachelor's Programme Biology (Bachelor) > Ergänzungsmodule		
Zuständige Personen	• Wark, Michael (module responsibility) • Wark, Michael (Prüfungsberechtigt) • Bottke, Patrick (Prüfungsberechtigt)		
Prerequisites			
Skills to be acquired in this module	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.		
Module contents	Lecture: General and inorganic chemistry (3 SWS) 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. Exercise: Exercise for the lecture General and Inorganic Chemistry (1 SWS)		
Literatureempfehlungen	Zeeck: Chemie für Mediziner, Urban & Schwarzenberg; Latscha/Katzmaier: Chemie für Biologen, Springer; Riedel: Anorganische Chemie, de Gruyter; Holleman-Wiberg: Lehrbuch der Anorganischen Chemie, de Gruyter; Skript zur Vorlesung		
Links			
Language of instruction	German		
Duration (semesters)	1 Semester		
Module frequency	jährlich		
Module capacity	unlimited		
Reference text	6 KP / WiSe: V 101, Ü 101Ü		
Examination	Prüfungszeiten	Type of examination	
Final exam of module	Klausur am Beginn der vorlesungsfreien Zeit (normalerweise Anfang Februar)	written exam (100%)	
Lehrveranstaltungsform	Comment	SWS	Frequency
Lecture		3	WiSe
Exercises		1	WiSe
Präsenzzeit Modul insgesamt			56 h
		Workload of compulsory attendance	

che102 - Basic Chemistry Laboratory

Module label	Basic Chemistry Laboratory			
Modulkürzel	che102			
Credit points	6.0 KP			
Workload	180 h			
Verwendbarkeit des Moduls	• Bachelor's Programme Biology (Bachelor) > Naturwissenschaftliche Grundlagen • Bachelor's Programme Mathematics (Bachelor) > Nebenfachmodule • Dual-Subject Bachelor's Programme Biology (Bachelor) > Ergänzungsmodule			
Zuständige Personen	• Koch, Rainer (module responsibility) • Koch, Rainer (Prüfungsberechtigt)			
Prerequisites	bestandene Modulprüfung che101 (Nachweis chemischer Grundkenntnisse für Laborsicherheit)			
Skills to be acquired in this module	Die Studierenden beherrschen die praktischen Grundlagen der allgemeinen und anorganischen Chemie. Sie lernen die Arbeit im chemischen Labor anhand von Standardprozeduren kennen und machen sich mit den Grundregeln der chemischen Laborpraxis vertraut. Sie können die Durchführung und die Beobachtung chemischer Experimente nach den Regeln guter wissenschaftlicher Praxis dokumentieren und die Ergebnisse von Versuchen aussagekräftig und fundiert protokollieren.			
Module contents	VL: Theoretische Grundlagen der im Praktikum durchgeführten Versuche PR: Einführung in die Laborpraxis: Erlernen wichtiger Standardprozeduren im chemischen Labor.			
Literaturempfehlungen	Lehrbücher der allgemeinen und anorganischen Chemie, z.B. Riedel, Anorganische Chemie, de Gruyter; Holleman-Wiberg, Lehrbuch der Anorganischen Chemie, de Gruyter; Zeeck: Chemie für Mediziner, Urban & Schwarzenberg; Latsche/Katzmaier: Chemie für Biologen, Springer; Praktikumsskript.			
Links				
Language of instruction	German			
Duration (semesters)	1 Semester			
Module frequency	jährlich			
Module capacity	unlimited (Die maximale Teilnehmerzahl ist beim Modulverantwortlichen zu erfragen.)			
Reference text	VL 5.07.714, PR 5.07.713			
Examination	Prüfungszeiten		Type of examination	
Final exam of module			not graded	
Lehrveranstaltungsform	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		1	WiSe	14
Practical training		5	WiSe	70
Präsenzzeit Modul insgesamt				84 h

che190 - Basic Organic Chemistry

Module label	Basic Organic Chemistry
Modulkürzel	che190
Credit points	6.0 KP
Workload	180 h
Verwendbarkeit des Moduls	• Bachelor's Programme Biology (Bachelor) > Naturwissenschaftliche Grundlagen • Bachelor's Programme Chemistry (Bachelor) > Aufbaumodule • Dual-Subject Bachelor's Programme Biology (Bachelor) > Ergänzungsmodule • Dual-Subject Bachelor's Programme Chemistry (Bachelor) > Aufbaumodule • Dual-Subject Bachelor's Programme Chemistry (Bachelor) > Erweiterungsmodule • Master of Education Programme (Special Needs Education) Chemistry (Master of Education) > Mastermodule • Master of Education Programme (Vocational and Business Education) Chemistry (Master of Education) > Mastermodule
Zuständige Personen	• Christoffers, Jens (module responsibility) • Christoffers, Jens (Prüfungsberechtigt) • Hilt, Gerhard (Prüfungsberechtigt) • Doye, Sven (Prüfungsberechtigt) • Hilt, Gerhard (Module counselling) • Doye, Sven (Module counselling) • Christoffers, Jens (Module counselling)
Prerequisites	
Skills to be acquired in this module	Kenntnisse Grundlegende Stoffsystematik der Organischen Chemie, Reaktionsweisen organischer Verbindungen, grundlegende Reaktionsmechanismen Fertigkeiten Beherrschung der Grundlagen der Organischen Chemie: Stoffklassen, funktionelle Gruppen, Nomenklatur; Formulieren organisch-chemischer Reaktionsgleichungen, Transformationen funktioneller Gruppen, Aufbau von Kohlenstoff-Kohlenstoff-Bindungen; Benennung der Konfiguration chiraler Verbindungen
Module contents	• Mit dem Besuch dieses Moduls erwerben die Studierenden das Basiswissen der Organischen Chemie. • Hierzu zählen insbesondere Kenntnisse über die Stoffsystematik, die Nomenklatur, eine Übersicht über funktionelle Gruppen, deren Herstellung und wichtigste Eigenschaften, die Stereochemie, die Reaktivität organischer Verbindungen, grundlegende Reaktionsmechanismen, wichtige synthetische Makromoleküle und die bedeutendsten Naturstoffklassen.
Literaturempfehlungen	• Wird in der Vorlesung bekannt gegeben
Links	
Language of instruction	German
Duration (semesters)	1 Semester
Module frequency	jährlich
Module capacity	unlimited
Reference text	Empfohlene Belegung: 3. Fachsemester (WiSe)

Examination	Prüfungszeiten	Type of examination
Final exam of module	• In der vorlesungsfreien Zeit entsprechend separater Ankündigung	written exam
Lehrveranstaltungsform	Lecture	
SWS	4	
Frequency	WiSe	
Workload Präsenzzeit	56 h	

che290 - Experimental Organic Chemistry

Module label	Experimental Organic Chemistry			
Modulkürzel	che290			
Credit points	6.0 KP			
Workload	180 h			
Verwendbarkeit des Moduls	• Bachelor's Programme Biology (Bachelor) > Naturwissenschaftliche Grundlagen • Dual-Subject Bachelor's Programme Biology (Bachelor) > Ergänzungsmodule • Dual-Subject Bachelor's Programme Chemistry (Bachelor) > Aufbaumodule • Master of Education Programme (Vocational and Business Education) Chemistry (Master of Education) > Mastermodule			
Zuständige Personen	• Doye, Sven (module responsibility) • Christoffers, Jens (Prüfungsberechtigt) • Doye, Sven (Prüfungsberechtigt) • Martens, Jürgen (Prüfungsberechtigt) • Hilt, Gerhard (Prüfungsberechtigt) • Christoffers, Jens (Module counselling) • Doye, Sven (Module counselling) • Hilt, Gerhard (Module counselling)			
Prerequisites	Erfolgreiche Teilnahme am Modul "che190 - Grundvorlesung Organische Chemie"			
Skills to be acquired in this module	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.			
Module contents	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.			
Literatureempfehlungen				
Links	https://uol.de/oc-doye/lehre			
Language of instruction	German			
Duration (semesters)	1 Semester			
Module frequency	jährlich			
Module capacity	70			
Reference text	SoSe: PR 204, S 205 / 4. FS / Doye			
Examination	Prüfungszeiten		Type of examination	
Final exam of module	Konsultationen zu den Experimenten und Anfertigung von Versuchsprotokollen begleitend zum Praktikum, ein Vortrag im Anschluss an das Praktikum (Termine laut Aushang), eine mündliche Prüfung von maximal 45 Minuten Dauer nach erfolgreichem Abschluss der anderen zu erbringenden Leistungen und Terminvereinbarung mit einem der möglichen Prüfer spätestens zum Ende des Semesters		KL	
Lehrveranstaltungsform	Comment	SWS	Frequency	Workload of compulsory attendance
Seminar	Blockveranstaltung	3	SoSe	42
Practical training	Blockveranstaltung	3	SoSe	42
Präsenzzeit Modul insgesamt				84 h

mat980 - Mathematics for the Life Sciences

Module label		Mathematics for the Life Sciences			
Modulkürzel		mat980			
Credit points		6.0 KP			
Workload		180 h			
Verwendbarkeit des Moduls		• Bachelor's Programme Biology (Bachelor) > Naturwissenschaftliche Grundlagen • Dual-Subject Bachelor's Programme Biology (Bachelor) > Ergänzungsmodule			
Zuständige Personen		• Vertman, Boris (module responsibility) • Werner, Tino (Module counselling) • Schöpfer, Frank (Module counselling) • Shestakov, Ivan (Module counselling)			
Prerequisites					
Skills to be acquired in this module		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.			
Module contents		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).			
Literaturempfehlungen					
Links					
Language of instruction		German			
Duration (semesters)		1 Semester			
Module frequency		jährlich			
Module capacity		unlimited			
Reference text		6 KP 1 V: 981, 1 Ü: 982 1. FS			
Examination		Prüfungszeiten		Type of examination	
Final exam of module		Vorlesungsende		KL	
Lehrveranstaltungsform	Comment	SWS	Frequency	Workload of compulsory attendance	
Lecture		3		42	
Exercises		1		14	
Präsenzzeit Modul insgesamt					56 h

phy910 - Physics for Students of Biology and Dual Subject Chemistry

Module label	Physics for Students of Biology and Dual Subject Chemistry			
Modulkürzel	phy910			
Credit points	6.0 KP			
Workload	180 h			
Verwendbarkeit des Moduls	• Bachelor's Programme Biology (Bachelor) > Naturwissenschaftliche Grundlagen • Dual-Subject Bachelor's Programme Biology (Bachelor) > Ergänzungsmodule • Dual-Subject Bachelor's Programme Chemistry (Bachelor) > Aufbaumodule			
Zuständige Personen	• Gütay, Levent (module responsibility) • Petrovic, Vlaho (module responsibility) • Petrovic, Vlaho (Prüfungsberechtigt) • Gütay, Levent (Prüfungsberechtigt)			
Prerequisites	Keine			
Skills to be acquired in this module	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			
Module contents	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.			
Literaturempfehlungen	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			
Links	http://www.uni-oldenburg.de/physik/praktika/bio-che/bio/			
Language of instruction	German			
Duration (semesters)	1 Semester			
Module frequency	jährlich			
Module capacity	unlimited			
Examination	Prüfungszeiten		Type of examination	
Final exam of module	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
Präsenzzeit Modul insgesamt				4 h

Abschlussmodul

bam - Bachelor's Thesis Module

Module label	Bachelor's Thesis Module	
Modulkürzel	bam	
Credit points	15.0 KP	
Workload	450 h	
Verwendbarkeit des Moduls	Dual-Subject Bachelor's Programme Biology (Bachelor) > Abschlussmodul	
Zuständige Personen	- Hößle, Corinna (module responsibility) - Winkler, Holger (Module counselling) - Plewka, Isabelle (Module counselling) - Wübben, Anja (Module counselling) - der Biologie, Lehrende (Prüfungsberechtigt)	
Prerequisites		
Skills to be acquired in this module	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. ++ biological knowledge ++ knowledge of biological working methods + statistics & scientific programming + abstract, logical, analytical thinking ++ deepened expertise in biological specialist field ++ independent learning and (research-based) working ++ data presentation and evidence-based discussion (written and spoken) + (scientific) communication skills ++ project and time management	
Module contents	Preparing the Bachelor thesis Active participation in the seminar of the research group, in which the Bachelor's thesis is written	
Literatureempfehlungen	Supervisors may supply an initial reading list with important literature. The students are expected to find and use further literature as needed.	
Links		
Languages of instruction	German, English	
Duration (semesters)	1 Semester	
Module frequency	halbjährlich	
Module capacity	unlimited	
Examination	Prüfungszeiten	Type of examination
Final exam of module		Bachelor's thesis (12 CP) and accompanying seminar (3 CP)
Lehrveranstaltungsform	Seminar	
SWS	1	
Frequency	--	
Workload Präsenzzeit	14 h	

