

Mastermodule

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- und 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

bio120 - Science-Teaching and Learning in School-Labs

Module label	Science-Teaching and Learning in School-Labs	
Modulkürzel	bio120	
Credit points	3.0 KP	
Workload	90 h	
Verwendbarkeit des Moduls	• Master of Education Programme (Gymnasium) Biology (Master of Education) > Mastermodule • Master of Education Programme (Special Needs Education) Biology (Master of Education) > Mastermodule	
Zuständige Personen	• Hößle, Corinna (module responsibility) • Hößle, Corinna (Module counselling) • Weusmann, Birgit (Module counselling) • Winkler, Holger (Module counselling) • Plewka, Isabelle (Module counselling) • Wübben, Anja (Module counselling) • Hößle, Corinna (Prüfungsberechtigt) • Weusmann, Birgit (Prüfungsberechtigt) • Winkler, Holger (Prüfungsberechtigt) • Plewka, Isabelle (Prüfungsberechtigt) • Wübben, Anja (Prüfungsberechtigt)	
Prerequisites	Studierende des GHR-Lehramtes wählen aus dem Modul 120 zwei Seminare aus (Lernlabor Wattenmeer, Grüne Schule oder Streifzüge sowie Achtsamkeitsübungen stehen zur Auswahl). In jedem Seminar wird eine Leistung erbracht, die Mindeststandards erfüllen muss, aber unbenotet bleibt.	
Skills to be acquired in this module	Die Studierenden gestalten Lehr-Lernprozesse unter Berücksichtigung fachlicher und fachdidaktischer Erkenntnisse zur Förderung von Lernprozessen. Dabei stehen wahlweise die Themen der Botanik und Ökologie (Grüne Schule) oder das Thema Ozean (Lernlabor Wattenmeer) unter Berücksichtigung aktueller Forschungserkenntnisse im Fokus des Seminars. In beiden Varianten werden Lernmaterialien in Anlehnung an das Konzept 'Bildung für nachhaltige Entwicklung' entwickelt. Die Studierenden konzipieren Aufgabenstellungen kriteriengerecht und formulieren sie adressatengerecht. Die Lerneinheiten werden im Lernlabor erprobt, Entwicklungsstände, Lernpotenziale, Lernhindernisse und Lernfortschritte werden diagnostiziert und die didaktisch-methodischen Konzepte reflektiert und adaptiert. Dabei nehmen die Studierenden eine forschende Haltung im Sinne des Ansatzes "Forschendes Lernen" ein. In den Seminaren im Lernlabor Wattenmeer werden digitale, barrierearme Elemente in die Unterrichtseinheiten implementiert, praktisch mit Schüler*innen getestet und aus fachlicher und fachdidaktischer Sicht reflektiert.	
Module contents		
Literaturempfehlungen	Gerhardt, A., Hartin, W. (2012): Blickpunkt Natur. Biologieunterricht rund um die Schule. Brogmus, H. Grothjohann, N., Gerhardt, A., Müller, S. (2010) Vielfalt wahrnehmen, untersuchen, erkennen, verstehen. Aulis Verlag. Paradies, Liane (2011): Diagnostizieren, Fordern und Fördern. Cornelsen Scriptor Berlin Hesse, Ingrid, Latzko, Brigitte (2011): Diagnostik für Lehrkräfte, Thieme, Stuttgart Ruppert, W., Spörhase, U., Barfod-Werner, I., Bätz, K. Fachmethodik: Biologie-Methodik: Handbuch für die Sekundarstufe I und II, Cornelsen Scriptor Berlin Stripf, R., Barthelmes, J., Faust, K. (2010): Biologie allgemein / Methoden-Handbuch Biologie: in 2 Bänden, Aulis Verlag.	
Links		
Language of instruction	German	
Duration (semesters)	1 Semester	
Module frequency	halbjährlich	
Module capacity	unlimited	
Reference text	Studierende des GHR-Lehramtes wählen aus dem Modul 120 zwei Seminare aus (Lernlabor Wattenmeer, Grüne Schule oder Streifzüge sowie Achtsamkeitsübungen stehen zur Auswahl). In jedem Seminar wird eine Leistung erbracht, die Mindeststandards erfüllen muss, aber unbenotet bleibt.	
Examination	Prüfungszeiten	Type of examination
Final exam of module	Die Veranstaltung ist unbenotet.	1 unbenotetes Portfolio (Entwicklung eines Kurzentwurfes samt Arbeitsblättern/Forschertagebuch und eines Diagnosebogens, Durchführung und Reflektion eines Lernarrangements)

Lehrveranstaltungsform	Comment	SWS	Frequency	Workload of compulsory attendance
Seminar		2	SoSe und WiSe	28
Study trip			SoSe	0
Präsenzzeit Modul insgesamt				28 h

bio130 - Human Biology Experiments for Science Education

Module label	Human Biology Experiments for Science Education
Modulkürzel	bio130
Credit points	6.0 KP
Workload	180 h
Verwendbarkeit des Moduls	• Master of Education Programme (Gymnasium) Biology (Master of Education) > Mastermodule • Master of Education Programme (Hauptschule and Realschule) 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) • Hößle, Corinna (Prüfungsberechtigt) • Rathje, Wiebke (Prüfungsberechtigt) • Plewka, Isabelle (Prüfungsberechtigt) • Wübben, Anja (Prüfungsberechtigt)
Prerequisites	Voraussetzung an der Teilnahme ist der erfolgreiche Abschluss des Moduls bio100 "Einführung in die Biologiedidaktik".
Skills to be acquired in this module	Die Studierenden erwerben folgende Kompetenzen. Sie • verfügen über ein strukturiertes Fachwissen in Bezug auf Humanbiologie • verfügen über grundlegendes fachdidaktisches Wissen und können dieses bei der Planung von Lernarrangements unter Berücksichtigung heterogener Lernvoraussetzungen zum Thema Humanbiologie anwenden • 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 • verfügen über grundlegende Kenntnisse zu potentiellen Lernschwierigkeiten und zu der Vielfalt von Schülervorstellungen im Themenbereich Humanbiologie und Genetik • verfügen über grundlegende Kenntnisse von fachdidaktischen Theorien, ausgewählter Ergebnisse aus der Lehr- und Lernforschung zur Kompetenzentwicklung und zu Schülervorstellungen sowie der curricularen Rahmenbedingungen und können diese reflektieren. • 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 eine Seminar und eine Übung. Im Rahmen der Veranstaltung werden die Studierenden zunächst in die fachlichen Grundlagen humanbiologischer Themen und Genetik eingeführt. Daran schließt sich die praktische Erprobung unterschiedlicher Schulversuche sowie das Arbeiten an Modellen an, die unter Berücksichtigung der Methode "Lernen an Stationen/Lernstraße" durchlaufen werden. Die Studierenden erlernen hierbei basale biologische Arbeits- Erkenntnismethoden an und entwickeln Lernarrangements zum hypothesengeleiteten Experimentieren. Im Seminar werden die Schulversuche hinsichtlich ihrer didaktischen Relevanz und Eignung reflektiert. Abschließend finden eine Vorstellung sowie eine Reflexion verschiedener fachdidaktischer Themen aus der Lehr-Lernforschung statt. Folgende fachbiologische und biologiedidaktischen Grundlagen sind Inhalt der Veranstaltung:

- Humanbiologie: Atmung, Herz-Kreislauf, Blut, Ernährung, Verdauung, Sinnesorgane
- Genetik
- Immunbiologie
- Neurobiologie
- Sexualkunde
- Grundlagen biologisches Lernens und Lehrens
- Grundlagen biologischen Reflektierens und Kommunizierens
- Gestaltung von Lernarrangements
- Strategien zum Umgang mit biologiespezifischen digitalen Werkzeugen im Biologieunterricht
- Umgang mit Heterogenität im Biologieunterricht

Folgende biologiedidaktische Themen aus der Lehr-Lernforschung sind in Inhalt der Veranstaltung:

- Umgang mit Schülervorstellungen im Unterricht
- Arbeiten mit Modellen im Biologieunterricht
- Besonderheiten des Classroom-Management im Biologieunterricht
- Binnendifferenzierung im Biologieunterricht
- Gestaltung eines inklusiven Biologieunterrichts
- Lernförderlicher Einsatz von Fachsprache
- Gesundheitserziehung am Beispiel Ernährung und Sexualkunde
- Gestaltung von gendersensiblen Sexualkundeunterricht
- Möglichkeiten des Fächerübergreifenden und -verbindenden Unterrichts

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

Humanbiologie für Lehramtsstudierende : ein Arbeits- und Studienbuch, Armin Baur ; Sylva Baur, 2. Auflage., Berlin Heidelberg : Springer Spektrum, 2022

Fachdidaktik Biologie, Harald Gropengießer ; Ute Harms, Hannover: Aulis Verlag in Friedrich Verlag GmbH, 2023

Forschendes Lernen im Experimentalpraktikum Biologie: eine praktische Anleitung für die Lehramtsausbildung, Till Bruckermann; Kirsten Schlüter, Berlin: Springer Spektrum, 2017

Schülervorstellungen im Biologieunterricht : Ursachen für Lernschwierigkeiten

Marcus Hammann; Roman Asshoff, 4. Auflage, Seelze: Klett/Kallmeyer, 2019

Sexuelle Bildung in der Schule: themenorientierte Einführung und Methoden, Beate Martin ; Jörg Nitschke, 1. Auflage, Stuttgart: W. Kohlhammer Verlag, 2017

Lernprozesse digital unterstützen : ein Methodenbuch für den Unterricht, Monika Heusinger, 2. Auflage, Weinheim Basel: Beltz, 2022

Links

Language of instruction		German		
Duration (semesters)		1 Semester		
Module frequency		jährlich		
Module capacity		unlimited		
Examination	Prüfungszeiten	Type of examination		
Final exam of module	Semesterbegleitend	1 portfolio		
Lehrveranstaltungsform	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		1		14
Practical training		4		56
Präsenzzeit Modul insgesamt				70 h

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.			
Literaturempfehlungen	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. Mihalca. 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
Exercises		6	WiSe	84
Seminar		2	WiSe	28

Lehrveranstaltungsform	Comment	SWS	Frequency	Workload of compulsory attendance
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			
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	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

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	

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)			
Literaturempfehlungen	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			

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	

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

bio395 - Plant Molecular Biology and Genetics I

Module label	Plant Molecular Biology and Genetics I			
Modulkürzel	bio395			
Credit points	6.0 KP			
Workload	180 h			
Verwendbarkeit des Moduls	• 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	• 1 N., N. (module responsibility)			
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 ++ independent learning and (research-based) working ++ data presentation and evidence-based discussion (written and spoken) ++ teamwork ++ (scientific) communication skills ++ project and time management + knowledge of safety and environmental issues The module serves the in-depth study of state-of-the-art techniques and problems in the field of molecular plant biology and plant genetics. Specialist competencies: basic knowledge in plant genetics, plant developmental genetics, plant/environment interactions and molecular basis of gene regulation General competencies: Presentation of scientific papers, presentation techniques, teamwork, problem solving competencies			
Module contents	Part of this module is a lecture that addresses several topics of modern plant molecular biology. The main focus is on plant developmental genetics, plant/environment interactions and the underlying molecular mechanisms of gene regulation in plants. At the beginning of the module, the students will present diverse molecular biology techniques and the latest developments in the field in a "method and techniques" seminar. In a "literature" seminar, the students will present and discuss a recent publication on one of the above-mentioned topics.			
Literatureempfehlungen	Literature will be handed out at the beginning of the course.			
Links				
Languages of instruction	German, English			
Duration (semesters)	1 Semester			
Module frequency	jährlich			
Module capacity	16			
Reference text	This module is mandatory for "Plant molecular biology and genetics II"			
Examination	Prüfungszeiten		Type of examination	
Final exam of module			Written examination (good seminar presentations improve the grade)	
Lehrveranstaltungsform	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		2	WiSe	28
Seminar		2	WiSe	28
Präsenzzeit Modul insgesamt				56 h

bio396 - Plant Molecular Biology and Genetics II

Module label	Plant Molecular Biology and Genetics II	
Modulkürzel	bio396	
Credit points	6.0 KP	
Workload	180 h	
Verwendbarkeit des Moduls	• 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	• Laubinger, Sascha (module responsibility) • Laubinger, Sascha (Prüfungsberechtigt)	
Prerequisites	bio395 Plant molecular biology and genetics I	
Skills to be acquired in this module	++ biological knowledge ++ knowledge of biological working methods + biologically relevant knowledge in the natural sciences and mathematics + statistics & scientific programming ++ interdisciplinary knowledge & thinking ++ abstract, logical, analytical thinking ++ deepened expertise in biological specialist field ++ independent learning and (research-based) working ++ data presentation and evidence-based discussion (written and spoken) ++ teamwork ++ (scientific) communication skills ++ project and time management + knowledge of safety and environmental issues The module serves the in-depth study of state-of-the-art techniques and problems in the field of molecular plant biology and plant genetics. Specialist competencies: Aquiring basic skill in plant molecular biology, genetics and plant biochemistry Methodological competencies: molecular biology techniques, conducted independently General competencies: Presentation of scientific results, presentation techniques, teamwork, problem solving competencies	
Module contents	Part of this module is a lecture that adresses several topics of modern plant molecular biology. The main focus is on plant developmental genetics, plant/environment interactions and the underlying molecular mechanisms of gene regulation in plants. At the beginning of the module, the students will present diverse molecular biology techniques and the latest developments in the field in a "method and techniques" seminar. In a "literature" seminar, the students will present and discuss a recent publication on one of the above-mentioned topics.	
Literaturempfehlungen	Literature will be handed out at the beginning of the course.	
Links		
Languages of instruction	German, English	
Duration (semesters)	1 Semester	
Module frequency	annually	
Module capacity	16	
Examination	Prüfungszeiten	Type of examination
Final exam of module		portfolio (presentation, protocols)
Lehrveranstaltungsform	Exercises	
SWS	4	
Frequency	WiSe	

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			

bio408 - Introduction to Neurobiology I

Module label	Introduction to Neurobiology I			
Modulkürzel	bio408			
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) • Koch, Karl-Wilhelm (Module counselling) • Janssen-Bienhold, Ulrike (Module counselling) • Janssen-Bienhold, Ulrike (Prüfungsberechtigt) • Greschner, Martin (Prüfungsberechtigt) • Koch, Karl-Wilhelm (Prüfungsberechtigt) • Dömer, Patrick (Prüfungsberechtigt)			
Prerequisites	Abschluss der Basismodule			
Skills to be acquired in this module	[nop]++ biologische Fachkenntnisse ++ Kenntnisse biologischer Arbeitstechniken + biologierelevante naturwissenschaftliche/mathematische Grundkenntnisse + Abstraktes, logisches, analytisches Denken ++ Datenpräsentation und evidenzbasierte Diskussion in Wort und Schrift + Teamfähigkeit [/nop]			
Module contents	Der Vorlesungsstoff (3 SWS) umfasst im Teil I die molekularen und zellulären Grundlagen der Neurobiologie, die elektrischen Vorgänge in Nervenzellen, die Organisation und Entwicklung des Nervensystems, die Funktion am Beispiel einfacher Schaltkreise. Im Seminar (1 SWS) werden einzelne Themen aus der Vorlesung vertiefend behandelt.			
Literaturempfehlungen	Purves D. et al.: Neuroscience, Sinauer Associates, Sunderland USA, jeweils neueste Auflage.			
Links				
Language of instruction	German			
Duration (semesters)	1 Semester			
Module frequency	Sommersemester			
Module capacity	unlimited			
Reference text	Aus bio405 und bio408 kann nur 1 Modul gewählt werden. Verknüpft mit den Modulen bio415 und bio416 Einführung in die Neurobiologie II im WS			
Examination	Prüfungszeiten		Type of examination	
Final exam of module			1 Klausur; aktive Teilnahme im Seminar	
Lehrveranstaltungsform	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		3	SoSe	32
Seminar		1	SoSe	14
Tutorial			SoSe oder WiSe	0
Präsenzzeit Modul insgesamt			46 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 processing in sensory systems, the plasticity of the nervous system and the mechanisms underlying cognitive processing. In the seminar, topics related to the lectures of the week are covered in more depth.			
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

bio416 - Experiments in Neurobiology II

Module label	Experiments in Neurobiology II	
Modulkürzel	bio416	
Credit points	6.0 KP	
Workload	180 h	
Verwendbarkeit des Moduls	• 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	• Beutelmann, Rainer (module responsibility) • Thiel, Christiane Margarete (Module counselling) • Langemann, Ulrike (Module counselling) • Rosemann, Stephanie (Module counselling) • Rosemann, Stephanie (Prüfungsberechtigt) • Beutelmann, Rainer (Prüfungsberechtigt) • Thiel, Christiane Margarete (Prüfungsberechtigt) • Langemann, Ulrike (Prüfungsberechtigt)	
Prerequisites	bio415 "Introduction to Neurobiology II"	
Skills to be acquired in this module	++ deepened biological expertise ++ deepened knowledge of biological working methods ++ data analysis skills ++ data presentation and discussion in German and English (written and spoken) + teamwork + scientific/mathematical basic knowledge relevant for biology	
Module contents	The exercise immediately follows the module "Introduction to Neurobiology II". By experimenting with each other, the students deepen their knowledge in the fields of cognitive neuroscience and hearing science. The students analyze their own data (incl. statistics) and present these in a written report.	
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	
Examination	Prüfungszeiten	Type of examination
Final exam of module	end of module	portfolio (data analysis, presentation)
Lehrveranstaltungsform	Exercises	
SWS	4	
Frequency	WiSe	

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	

bio460 - Diversity of marine Invertebrates

Module label	Diversity of marine Invertebrates
Modulkürzel	bio460
Credit points	6.0 KP
Workload	180 h
Verwendbarkeit des Moduls	- Dual-Subject Bachelor's Programme Biology (Bachelor) > Akzentsetzungsmodule - Master of Education Programme (Gymnasium) Biology (Master of Education) > Mastermodule
Zuständige Personen	1 N., N. (module responsibility)
Prerequisites	
Skills to be acquired in this module	++ biological knowledge + knowledge of biological working methods + interdisciplinary knowledge & thinking ++ deepened expertise in biological specialist field ++ independent learning and (research-based) working ++ data presentation and evidence-based discussion (written and spoken) + teamwork ++ (scientific) communication skills ++ project and time management + knowledge of safety and environmental issues By actively participating in this module the students acquire qualifications in the fields stated below: -Survey of recent subjects concerning the biology and morphology of aquatic organisms -Extended knowledge of how morphological characteristics have developed -Technical skills in preparing and documenting morphological structures -Knowledge of organizational principles of these structures
Module contents	The module serves an extended examination of selected aquatic animals from a function morphological point of view. Living and fixed animals are investigated and histological preparations are analysed. Thus, the morphology, anatomy, and histology are studied in detail. The biology and ecology of these animals are also considered, which enables the organisms to be studied very intensively and provides an illustrative basis for theoretical discussions.
Literatureempfehlungen	AX, P., 1995: Das System der Metazoa. I, II, III. Ein Lehrbuch der phylogenetischen Systematik. Gustav Fischer Verlag, Stuttgart, Jena. Textbook with somehow different ideas! Very well illustrated! Illustrations are suitable for presentations! GRÜNER, H.-E., 1993: „Der Kaestner“, A., Lehrbuch der speziellen Zoologie. All volumes, Gustav Fischer/Spektrum Akademischer Verlag, Jena, Stuttgart. Many interesting details are found only in these volumes! GRÜTER, W., 2001: Leben im Meer – Vielfalt und Zusammenhänge. Dr. Friedrich Pfeil Verlag, München. This book arouses your curiosity about the underwater world. HAYWARD, P. NELSON-SMITH, T., SHIELDS, C. & M. KREMER, 2008: Der neue Kosmos Strandführer - 1500 Arten der Küsten Europas. Franckh-Kosmos Verlag. This coastal guide provides excellent and clearly arranged colour tables for individual groups. HOFRICHTER, R., 2002: Das Mittelmeer, Fauna-Flora-Ökologie. Band I, II, Spektrum Akademischer Verlag, Heidenberg, Berlin. Numerous details on individual groups in the second part. WESTHEIDE, W. & R., RIEGER, 2013: Spezielle Zoologie. Band I, II. Gustav Fischer Verlag, Stuttgart, Jena. The textbook absolute! My explicit recommendation! The literature listed above is available in the university library in Wechloy. Further reading will be recommended in the course of the lecture. Literature inquiry:

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

Links				
Language of instruction		German		
Duration (semesters)		1 Semester		
Module frequency		annually		
Module capacity		15		
Examination		Prüfungszeiten		Type of examination
Final exam of module		During the lecture		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
Exercises		3	WiSe	42
Seminar		1	WiSe	14
Präsenzzeit Modul insgesamt				56 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

bio472 - Marine Biology Field Trip

Module label	Marine Biology Field Trip			
Modulkürzel	bio472			
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	++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 In completion of this modul students will: have a basic knowledge of the diversity of marine life; un-derstand the fundamental physiochemical and physiological processes underlying the productivity of marine environments; understand the ecological dynamics of marine ecosystems; appreciate the role of humans in disturbing and exploiting marine ecosystems; have developed a critical, analytical ap-proach to scientific research; have developed skills in writing scientific reports and in oral communica-tion of scientific information.			
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.			
Literatureempfehlungen	Will be announced in Studt IP.			
Links				
Language of instruction	German			
Duration (semesters)	1 Semester			
Module frequency	Sommersemester			
Module capacity	14 (Bei mehr Bewerber_innen als Plätzen entscheidet ein Motivations Schreiben über die Aufnahme.)			
Reference text	Takes place alternately with Bio470 Marinbiological Course I. (Change between focus on Felswatt / Sandwatt.) If there are more applicants than places available, a letter of motivation decides on the acceptance.			
Examination	Prüfungszeiten		Type of examination	
Final exam of module			1 Portfolio	
Lehrveranstaltungsform	Comment	SWS	Frequency	Workload of compulsory attendance
Seminar		2	SoSe	28
Exercises		2	SoSe	28
Präsenzzeit Modul insgesamt				56 h

bio473 - Evolutionsgeschichte des Lebens: Leben im Wandel der Erdzeitalter

Module label	Evolutionsgeschichte des Lebens: Leben im Wandel der Erdzeitalter			
Modulkürzel	bio473			
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) • Ahlrichs, Wilko (Prüfungsberechtigt)			
Prerequisites	none If there are more applicants than places available, a letter of motivation decides on the acceptance.			
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) +(scientific) communication skills Objective of the module/skills: Understanding of continental migration (plate tectonics), the formation of mountains and oceans. Understanding the formation of marine (coastal and deep sea), limnic and terrestrial habitats (e.g. swamp, forest, desert). Understanding the importance of climate change through continental migration, ice ages and climate catastrophes for the evolution of organisms. Knowledge of the phylogenetic system of important groups of organisms, their formation and evolution. Knowledge of the five major extinction events in Earth's history and their significance.			
Module contents	Content of the module: Earth age, continental migration, formation of marine, limnic and terrestrial habitats, species extinction, mass extinction and their causes (climate change, ice ages) and consequences (extinction and/or renewed radiation); anatomy and morphology ("baupläne") of ancestral species; evolution important characteristic complexes (nutrition, respiration, excretion and osmoregulation, reproduction, movement); important evolutionary steps of selected animals (e.g. molluscs with cephalopods, arthropods with insects, dinosaurs with birds, mammals with humans), taxa of plants and protists in the conquest of marine, limnic and terrestrial habitats.			
Literatureempfehlungen	Will be announced in Studt IP.			
Links				
Language of instruction	German			
Duration (semesters)	1 Semester			
Module frequency	Sommersemester			
Module capacity	unlimited (Sind mehr BewerberInnen als Plätze vorhanden, entscheidet ein Motivationsschreiben über die Annahme.)			
Examination	Prüfungszeiten		Type of examination	
Final exam of module	End of module		Portfolio	
Lehrveranstaltungsform	Comment	SWS	Frequency	Workload of compulsory attendance
Seminar		2	SoSe	28

Lehrveranstaltungsform	Comment	SWS	Frequency	Workload of compulsory attendance
Exercises		1	SoSe	14
Study trip		1	SoSe	14
Präsenzzeit Modul insgesamt				56 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

bio490 - Experimental Methods in Biology

Module label	Experimental Methods in Biology	
Modulkürzel	bio490	
Credit points	3.0 KP	
Workload	90 h	
Verwendbarkeit des Moduls	• Master of Education Programme (Gymnasium) Biology (Master of Education) > Mastermodule	
Zuständige Personen	• Nolte, Arne (module responsibility) • Nolte, Arne (Prüfungsberechtigt)	
Further responsible persons	all lecturers in biology	
Prerequisites		
Skills to be acquired in this module	Students become acquainted with important methods in diverse areas of biology (e.g. biochemistry, plant physiology, animal physiology, genetics, population biology, functional ecology). Practical and theoretical skills will enrich the methodology portfolio of the teachers-to-be. At least some of the methods will be directly applicable in real-life teaching situations.	
Module contents	E. Methods (2 SWS)	
Literatureempfehlungen		
Links		
Language of instruction	German	
Duration (semesters)	1 Semester	
Module frequency	annually	
Module capacity	10	
Examination	Prüfungszeiten	Type of examination
Final exam of module		1 report
Lehrveranstaltungsform	Exercises	
SWS	2	
Frequency	SoSe	

bio410 - Basic Concepts in Neurobiology II

Module label	Basic Concepts in Neurobiology II			
Modulkürzel	bio410			
Credit points	15.0 KP			
Workload	450 h			
Verwendbarkeit des Moduls	• Master of Education Programme (Gymnasium) Biology (Master of Education) > Mastermodule			
Zuständige Personen	• Klump, Georg Martin (Prüfungsberechtigt) • Langemann, Ulrike (Module counselling) • Thiel, Christiane Margarete (Module counselling) • Köppl, Christine (Module counselling)			
Prerequisites				
Skills to be acquired in this module	++ biological knowledge ++ knowledge of biological working methods + abstract, logical, analytical thinking + deepened expertise in biological specialist field + data presentation and evidence-based discussion (written and spoken) Basic knowledge and relations of sensory science, cognition, and motor functions are imparted. Transfer achievement: Presentation of personal experimental results.			
Module contents	The lecture covers the anatomy and function of simple sensory and motory systems as well as higher cognitive functions. Selected subjects are treated in more detail in the seminar. In the subsequent block practical course, this theoretical knowledge is verified under real-world conditions by simple experiments related to the subjects dealt with in the lecture including data analysis and presentation of results.			
Literatureempfehlungen	Purves D, Augustine GJ, Fitzpatrick D, Hall WC, LaMantia AS, McNamara JO, White LE (2008) Neuroscience. Palgrave Macmillan			
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 course of the semester vacation (usually in March)	1 written examination PLEASE NOTE: Additional conditions regarding attendance and ungraded activities as determined by the persons responsible for the module will apply.		
Lehrveranstaltungsform	Comment	SWS	Frequency	Workload of compulsory attendance
Lecture		4		56
Exercises		5		70
Seminar		1		14
Präsenzzeit Modul insgesamt				140 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	

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	

Abschlussmodul

mam - Master's Thesis Module

Module label	Master's Thesis Module		
Modulkürzel	mam		
Credit points	27.0 KP		
Workload	810 h		
Verwendbarkeit des Moduls	• Master of Education Programme (Gymnasium) Biology (Master of Education) > 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	biologische Fachkenntnisse + Kenntnisse biologischer Arbeitstechniken + biologierelevante naturwissenschaftliche/mathematische Grundkenntnisse + Kenntnisse in empirischer Sozialforschung (qualitative bzw. quantitative Forschungsansätze) + Kenntnisse hinsichtlich der Entwicklung, Durchführung, Auswertung und Präsentation einer Studie im Bereich der Lehr- und Lernforschung + Prinzipien des Forschenden Lernens in Bezug auf die eigene Studie anwenden + fächerübergreifendes Denken + Abstraktes, logisches, analytisches Denken ++ (wissenschaftliche) Kommunikationsfähigkeit ++ Projekt- und Zeitmanagement		
Module contents	Anfertigung einer Masterarbeit, aktive Mitarbeit im Seminar, Präsentation der Masterarbeit		
Literaturempfehlungen			
Links			
Languages of instruction			
Duration (semesters)	1 Semester		
Module frequency	WiSe und SoSe		
Module capacity	unlimited		
Examination	Prüfungszeiten	Type of examination	
Final exam of module		G	
Lehrveranstaltungsform	Seminar		
SWS	2		
Frequency	--		

