Master Ecology, Evolution, and Conservation

Institute of Biochemistry and Biology
University of Potsdam

Course packets and Module Manual

Version March 2025

The Institute of Biochemistry and Biology at the University of Potsdam is largely responsible for the curriculum of the international Master program in Ecology, Evolution, and Conservation. The program closely connects to current research activities at the institute. In this way, we achieve a high practical relevance of the study contents and an early participation of the students in the current research of the working groups at the university. Six cooperating research areas characterize our interdisciplinary profile:

1. Vegetation ecology and scientific nature conservation
2. Aquatic ecology and ecological modelling
3. Animal ecology and human biology
4. Biodiversity research / General and special botany
5. Evolutionary ecology and evolutionary biology / systematic zoology
6. Macroevolution

Questions about study format, master thesis, formalities? **Please check:**
https://www.uni-potsdam.de/en/meec/frequently-asked-questions-faq

Content of Module Manual (with hyperlinks)

BIO-O-KM1: State of the art in ecology, evolution, and conservation	BIO-O-KM2: Experimental design and data analysis

Analysis of high-throughput sequencing data	Anthropology
Astrobiology	Basics in limnoecology
Basic theoretical ecology	Behavioural Ecology
Biogeography	Bioimage analysis and extended phenotyping
Conservation Genetics	Dryland ecology
Ecological modeling with computer simulations	Ecology of the Mediterranean vegetation
Experimental plankton ecology	Macroecology and global change
Microevolution	Natural Disasters in the Anthropocene

Plant ecology	Regional and applied nature conservation
Taxonomy and biodiversity of fungi and lower plants	System Ecology and Evolution
Terrestrial palaeoecology	Vegetation ecology of Central Europe

4.2.2 Course packets starting in summer semester

Advanced theoretical ecology	Agroecology
Aquatic Field ecology	Crop plants and domestic animals
Ecology and Diversity of Terrestrial Plants	Experimental Animal Ecology
Genetic and genomic basis of evolutionary change	Geobotany
Geomicrobiology	Lake microbiology
Molecular microbial ecology	River and Ocean Ecology
The central role of evolutionary biology in biosciences	Quantitative conservation biogeography
Wetland eco-hydrology	Scientific nature conservation
Regional and applied nature conservation	

4.3 Electives (6LP) from Area B

4.4 Elective specialization modules (12 LP)

BIO-O-VM1: Plankton ecology	BIO-O-VM2: Animal ecology
BIO-O-VM3: Human biology	BIO-O-VM4: Ecological microbiology BIO-O-VM5: Microbial ecology
BIO-O-VM5: Microbial ecology	BIO-O-VM6: Biodiversity of land plants and fungi
BIO-O-VM7: Geobotany	BIO-O-VM8: Methods in conservation biology

BIO-O-VM9: Modelling in plant ecology and nature conservation	BIO-O-VM10: Arid-zone research
BIO-O-VM11: Data analysis, modelling, and theory in community ecology (alternative **A**)	BIO-O-VM11: Aquatic ecosystems and conservation – data analysis, modelling and management processes (alternative B)
BIO-O-VM12: Evolutionary biology (alternative **A**)	BIO-O-VM12: Evolutionary Biology (alternative **B**)

4.5 Facultative courses (non-credit courses/seminars)

1. Curriculum overview

This section provides a first overview about the structure of our master program. The curriculum is divided into administrative modules. Each module is to be assigned one course packet, which is composed of courses (i.e., lectures, seminars, practical courses and/or excursions). All obligatory, but not all elective courses are taught in English. In the first two semesters, among other things, we aim to balance the level of knowledge of all students in the three main topics of ecology, evolution and nature conservation. Moreover, we highly value a solid deepening of existing knowledge in the areas of experimental design, data collection and statistics, as profound methodological competence will be essential for all fields of activity of our graduates.
The Master program in *Ecology, Evolution, and Conservation* consists of the following modules with in total 120 credit points (CP):

Table 1: Overview of modules and credit points

Compulsory modules I and II	12 CP
Elective from area A and B	66 CP
Elective specialization module	12 CP
Master thesis	30 CP
Total	**120 CP**

- Compulsory module 1 (6 Credit Points = CP): State of the Art in Ecology, Evolution, and Conservation, and compulsory module 2 (6 CP): Experimental design and data analysis (in sum: 12 CP). Note that statistics are a major part of compulsory module 2.
- 6 elective modules from area A. Area A includes courses packets offered by the Institute of Biochemistry and Biology (in sum: 36 CP)
- 5 additional elective modules (which you have not chosen yet) from area A **or** from area B. Area B comprises courses offered by the Faculty of Science (in sum: 30 CP)
- 1 specialization module to prepare the Master thesis (12 CP)
- Master thesis (30 CP). Topics for master theses closely relate to current research topics in the respective working groups at the Institute of Biochemistry and Biology.

- Based on the two compulsory modules, 1 and 2, we offer a wide range of elective modules that can be selected by choosing course packages according to individual interests (Fig. 1). In doing so, we strongly rely on intellectual freedom and individual self-responsibility in the compilation of the modules and the specialization each student strives to achieve.

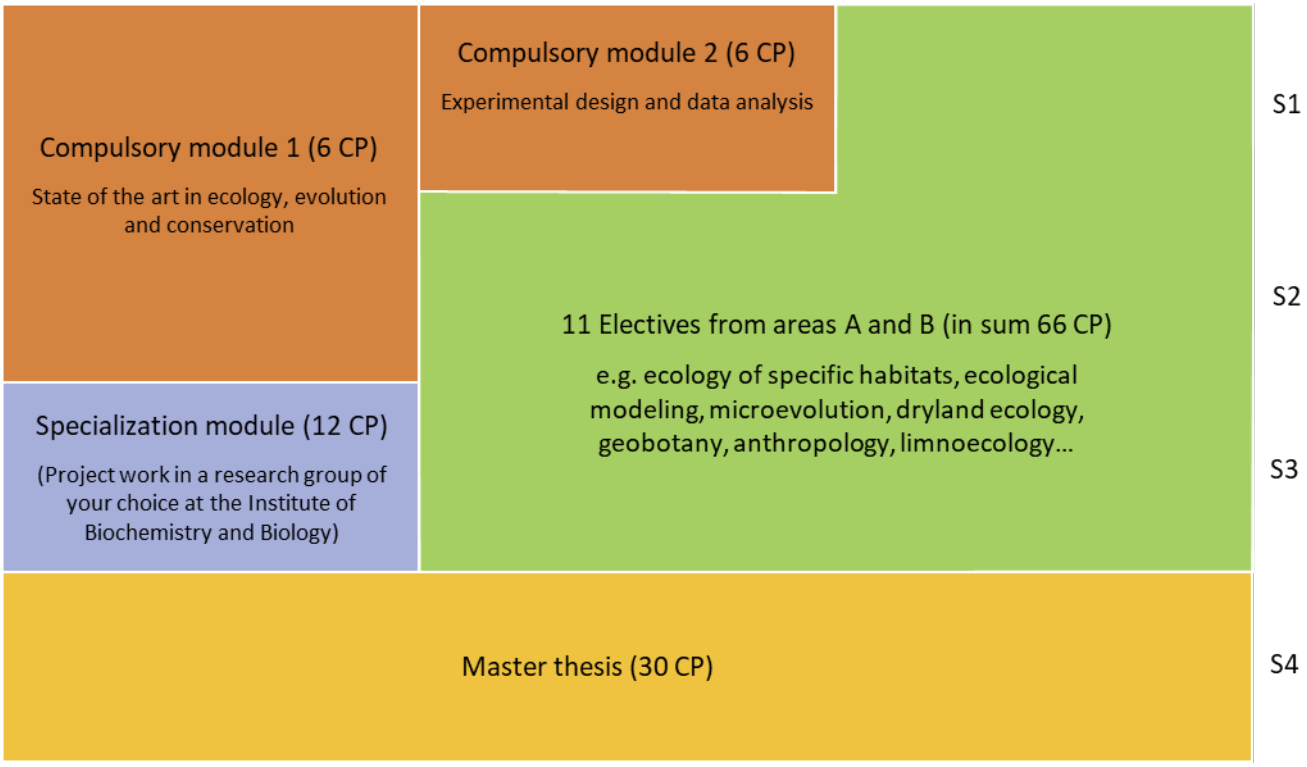

Fig. 1: Overview of the study plan: This is a general scheme for the master program in 4 semesters (S). This scheme applies if you start taking courses in the winter semester. If you start in the summer, the order of the compulsory modules is reversed.

2. Modules and master thesis

2.1. Module list and course packets

This section provides the module list according to the official study and examination regulations for the master program in *Ecology, Evolution, and Conservation*.

The electives modules BIO-O-WM1 to BIO-O-WM19 are administrative units. They serve as "containers" that students fill with a desired course packet. This way, a large number of course packets can be offered and new ones can be added every semester. This means that each student can choose course packets according and tailor their studies to their specific interest.

You may search for the module abbreviations (e.g. BIO-O-WM1) online in the electronic module administration system, short PULS, of the University of Potsdam. There, you will find very general module descriptions. Details on the course packets, which can be assigned to the elective modules are specified in this manual (Section 4.2). Each course packet description also entails a list of elective modules to which you can assign the course packet.

Table 2: Module list with credit points (CP)

Module abbreviation	Module name	CP
I Compulsory modules (*12 CP*)		
BIO-O-KM1	State of the art in ecology, evolution and conservation	6
BIO-O-KM2	Experimental design and data analysis	6
II Electives area A (*36 CP*)		
BIO-O-WM1	Organismic ecology	6
BIO-O-WM2	Basics of ecology	6
BIO-O-WM3	Concepts of ecology	6
BIO-O-WM4	Applied ecology	6
BIO-O-WM5	Data acquisition and analysis	6
BIO-O-WM6	Experimental ecology	6
BIO-O-WM7	Biodiversity research	6
BIO-O-WM8	Ecology of specific habitats I	6
BIO-O-WM9	Ecology of specific habitats II	6
BIO-O-WM10	Aquatic environmental ecology	6
BIO-O-WM11	Conservation biology	6
BIO-O-WM12	Applications of nature conservation	6
BIO-O-WM13	Biology of plants and fungi	6
BIO-O-WM14	Ecology of mammals	6
BIO-O-WM15	Theoretical ecology and ecological modelling I	6
BIO-O-WM16	Theoretical ecology and ecological modelling II	6
BIO-O-WM17	Interactions ecology, evolution, and genetics	6
BIO-O-WM18	The Central role of evolutionary biology in biosciences	6
BIO-O-WM19	Microevolution	6
III Electives area B (*30 LP*)		
BIO-B-WM10	Genome Research and Systems Biology B	6
BIO-B-WM11	Molecular Biology B	6
BIO-MBIP01	Algorithmic and mathematical Bioinformatics	6
BIO-MBIP02	Statistical bioinformatics	6
BIO-MBIP03	Bioinformatics of biological sequences (evolutionary genomics)	6
BIO-MBIP04	Analysis of Cellular Networks	6
BIO-B-KM1	State of the art in biochemistry and molecular biology	6
MAT-MBIP05	Introduction to theoretical systems biology	6
BIO-MBIP06	Constraint-based Modeling of cellular networks	6
BIO-MBIW01	Data Integration in Cellular Networks	6

BIO-MBIW02	Advanced methods for Analysis of Biochemical networks	6
BIO-MBIW07	Integration of cellular layers and systems	6
BIO-MBIB01	Introduction to databases and practical programming	6
BIO-MBIB03	Programming expertise	6
BIO-BRM17a	Current problems and modern methods in plant genetics and Epigenetics	6
GEW-B-WP01	Vertiefungsmodul Geologie I	6
GEW-B-WP05	Vertiefungsmodul Geophysik I	6
GEW-RCM03	Data analysis and statistics	6
GEE-TV3	Globaler Wandel – Die Erde als System	6
GEE-KL	Klimatologie	6
GEE-GV03	Ökosystemleistungen	6
GEE-M-MK7	Dynamische Umweltsysteme simulieren	6
GEW-GIS1	Grundlagen der Geoinformationssysteme (max. 30 participants)	6
GEW-RCM01	Remote Sensing of the Environment	6
GEW-RCM02	Earth System Science	6
INF-1010	Grundlagen der Programmierung	6
MATVMD834a	Stochastic Processes	6
MAT-M3	Fortgeschrittene Probleme der Geowissenschaften	6
PHY_131d	Simulation und Modellierung	6
PHY_541c	Aufbaumodul Statistische und nichtlineare Physik	6
MATBMD130	Basismodul Programmieren	6
IV Electives (specialization module, *12 LP*)		
BIO-O-VM1	Plankton ecology	12
BIO-O-VM2	Animal ecology	12
BIO-O-VM3	Human biology	12
BIO-O-VM4	Ecological microbiology	12
BIO-O-VM5	Microbial ecology	12
BIO-O-VM6	Biodiversity of land plants and fungi	12
BIO-O-VM7	Geobotany	12
BIO-O-VM8	Methods in conservation biology	12
BIO-O-VM9	Modelling in plant ecology and nature conservation	12
BIO-O-VM10	Arid-zone research	12
BIO-O-VM11	Data analysis, modelling, and theory in community ecology (alternative A or B)	12
BIO-O-VM12	Evolutionary biology (alternative A or B)	12
Sum of all compulsory modules and electives: 90 CP		

Table 3 below gives an overview of course packets (lines) and elective modules (columns) and how to combine them. Please note that **you can fill each elective module (column) only once**, so combine them wisely! We recommend creating a plan at the start of your studies to determine which course packages you would like to pursue. Make sure to allocate space in your schedule for these course packages (some may require only one or two modules!) To register for a course packet at the beginning of the semester, choose the module you want to assign it to and then proceed to the course registration in PULS (described in section 3).

Note that to finish the Master, you have to complete 6 elective modules in "Electives area A" and 5 elective modules in "Electives area B". You can assign course packets described in this manual to a module in "Electives area A" until full (6 modules). You can then assign more course packets to a module in "Electives area B" (in PULS, the modules appear under the same name as in "Electives area A", see section 3), or choose a module offered by a different institute listed above, until full (5 modules).

Table 3: Assignment of course packets (lines) to PULS modules (columns) from Elective area A (A = offered by Institute of Biochemistry and Biology). Each vertical line can be assigned to a course packet, which yields 6 LP and includes a mix of lectures, seminars, practical field or lab courses. Course packets are specified in chapter 4.2. | Start: s: summer semester, w: winter semester, wb: winter break (block course after winter semester), sb: summer break, w+s: 1 year packet running throughout winter and summer

Course packets	Assessor (Prüfer/In)	1: Organismic ecology	2: Basics of ecology	3: Concepts of ecology	4: Applied ecology	5: Data acquisition and analysis	6: Experimental ecology	7: Biodiversity research	8: Ecology of specific habitats 1	9: Ecology of specific habitats 2	10: Aquatic environmental e.	11: Conservation biology	12: Appl. nature conservation	13: Biology of plants and fungi	14: Ecology of Mammals	15: Theoretical ecology ... 1	16: Theoretical ecology ... 2	17: Interactions ecology, ...	18: Central role of evol ...	19: Microevolution	Start = summer | winter semester sb | wb: block after lecture period	German / English
Anthropology	Scheffler	1			1	1									1						w + wb	G / E
Behavioural Ecology	Eccard	1	1	1	1										1						w + wb	E
Experimental animal ecology	Eccard	1			1	1	1								1						sb	E
Macroecology and global change	Zurell				1							1	1			1	1				w	E
Quantitative conservation biogeography	Zurell				1							1	1			1	1				s	E
Crop plants and domestic animals	Heinken	1			1									1	1						s (+ sb)	G / E
Ecology and Diversity of Terrestrial Plants	Linstädter	1	1	1	1			1						1							s	E
Ecology of the mediterranean vegetation	Kummer	1			1			1	1	1				1							wb	G
Geobotany	Heinken	1			1			1	1	1			1	1							s + sb	E
Taxonomy & biodiversity of fungi & lower plants	Kummer	1	1					1						1				1			w	G
Vegetation ecology of central Europe	Heinken	1			1			1	1	1			1	1							w + sb	G
Microevolution	Tiedemann																			1	w + wb	E
System ecology and evolution	Tiedemann	1	1	1														1			w + s	G
The central role of evolutionary biology in biosci	Dominguez																		1		w + s	E
Dryland ecology	Blaum	1			1	1	1		1	1		1									w + s	E
Ecological modelling with computer simulations	Jeltsch				1								1			1	1				w + wb	E
Plant ecology	Jeltsch	1	1	1		1	1	1						1							w + sb	E
Regional and applied nature conservation	Jeltsch				1			1	1	1			1								w + s	E
Scientific nature conservation	Jeltsch			1	1			1				1									s	G
Advanced theoretical ecology	Guill			1												1	1				s	E
Aquatic Field ecology	Weithoff			1					1	1	1										s	E
Basics in limnoecology	Weithoff			1					1	1	1										w + s	E
Basic theoretical ecology	Klauschies		1	1												1	1				w + wb	E
Experimental plankton ecology	Weithoff	1				1	1		1	1	1										w	E
River and Ocean Ecology	Ehrlich		1		1				1	1	1										s	E
Agroecology	Nendel (ZALF)	1							1	1			1								s	E
Analysis of high througput sequencing data	Kappel					1												1			w	E
Astrobiology	deVera (DLR)			1					1	1								1			wb	E
Biogeography	Schmitt	1			1													1			w + s/sb	G
Bioimage and extended phenotyping	Kappel					1												1			w + wb	E
Conservation Genetics	Fickel (IZW)		1	1		1												1			w + wb	G
Genetic and genomic basis of evolutionary chang	Hofreiter																	1			s (+sb)	E
Geomicrobiology	Wagner	1					1	1													s + sb	E
Lake microbiology	Grossart (IGB)								1	1	1										s + sb	E
Molecular microbial ecology	Dittmann	1	1				1														s	E
Natural Disasters in the Anthropocene	Korup (GEW)				1								1								w	G
Terrestrial paleoecology	Herzschuh (AWI)	1	1	1														1			wb	E
Wetland eco-hydrology	Geissler				1				1	1	1										s	G

Units offering modules:
Vegetation ecology and scientific nature conservation
Aquatic ecology and ecological modelling
Animal ecology and human biology
Biodiversity research / General and special botany
Evolutionary biology / Systematic Zoology
Macroecology
Other units in IBB and extern (Alfred-Wegener-Institute (AWI), Institut f. Zoo- und Wildtierforschung (IZW), Deutsches Zentrum f. Luft- und Raumfahrt (DLR), Zentruf für Agrarlandschaftsforschung (ZALF), Institut f. Gewässerkunde und Binnenfischerei (IGB))

2.2. Specialization module

The specialization module is aimed to serve as a preparation for the master thesis. The students will be introduced to their tentative Master project by running preliminary experiments and by learning analyses and techniques specific to their chosen subject. Furthermore, the writing of a scientific protocol will be taught. The specialization module can, but does not have to be, on the same subject as the master thesis. It also serves as an introduction to the field and the research group. Upon finishing the module, the student can decide to continue with their master thesis on a similar subject or change it completely. External research may be accepted. Talk to a professor in the respective working group about this. Some specialization modules require previous knowledge gained in elective modules. Consult the description of the specialization modules in section 4.4 to know which course packets are required.

2.3. Master thesis

As soon as the student has successfully completed the course of studies and examinations to the extent of 75 percent of the total number of credit points to be completed in the degree program minus the credit points for the master's thesis (67.5 credit points), the student is entitled to the immediate assignment of a topic for the master's thesis.

The Master's thesis, including the disputation, has a scope of 30 credit points. Your master thesis is the final part of your studies and worth 30 CP.

Read more on the choice of committee and supervisors at:

https://www.uni-potsdam.de/en/meec/frequently-asked-questions-faq

3. Registering course packets, modules and exams in PULS

Registering courses is only available during the dedicated register period. It starts shortly before the beginning of the semester and closes 6 weeks later. During this period you can enrol or, if you decide to drop a course, unenroll in courses. Later registration via PULS is not possible. There are two paths to register course packets. Tip: use path 2 to have an overview of all courses offered in the current semester in our Master program. All paths can also be used to register specialization modules.

To register course packets, open the PULS website https://puls.uni-potsdam.de and sign in with your account details.

3.1. Registering course packets

Path 1

1. Click “Courses” → “Course catalog” → “Faculty of Sciences” → “Institut für Biochemie und Biologie” → “Master of Science” → “Ecology, Evolution and Conservation (Examination regulation of the winter semester 2019/20)”
2. Then choose either “Compulsory modules” to register either compulsory module 1 or 2, “Elective modules A or B” to register course packets or “Advanced modules” to register a specialization module
3. Choose the module you want to assign a course packet to
4. Click on each course that belongs to your selected course packet. Note: A course packet is made up of 1-3 components that you need to sign into separately via PULS.
5. Click on “apply now/cancel application”

6. Again choose the module you want to assign the course to. Choose a module from area A if you haven't collected 6 modules here. Once you have completed 6 modules, assign any further course packet to a module in area B.
7. Enter the required TAN number and click "Jetzt belegen/anmelden"
8. Note down which elective module and which elective area you assigned the course packet to.

Path 2

Tip: Using this path gives you an overview of all courses offered in the current semester in our Master program.

1. Click "Courses" → "Finding a course"
2. Under "Curricula" select "EcologyEvolutionConservat, Abschluss MS, PrüfungsOrdnung 20192 MSEEC" then click "Start Search"
3. All courses now displayed are currently offered and can be registered for
4. Click on each course that belongs to your selected course packet. Note: A course packet is made up of 1-3 components that you need to sign into separately via PULS.
5. Click on "apply now/cancel application"
6. Choose the module you want to assign the course to. Choose a module in area A if you haven't collected 6 modules here. Once you have completed 6 modules in area A, assign any further course packet to a module in area B.
7. Enter the required TAN number and click "Jetzt belegen/anmelden"
8. Note down which elective module and which elective area you assigned the course packet to.

3.2. Registering elective modules offered by other institutes

Courses offered by a different institute (listed in this Manual in Table 2, "III Elective area B (30 LP)") can be assigned to modules in Elective area B. You can best search for them in PULS via the "Finding a course" function.

1. Click "Courses" → "Finding a course"
2. Under "Title of lecture" type the name of the course you want to enrol for, then click "Start Search"
3. Click on the course you want to enrol for
4. Click on "apply now/cancel application"
5. Choose the module from area B you want to assign the course to
6. Enter the required TAN number and click "Jetzt belegen/anmelden"

3.3. Accessing course materials

Once you have signed up for classes in PULS you will receive information on the course packet via e-mail. All course materials and information is usually distributed via the platform Moodle (https://moodle2.uni-potsdam.de), where you have to sign up for additionally.

3.4. Registering exams

Exam registration usually opens a few weeks before the exam date and closes 8 days before the exam date. Ask your professor about exam dates. Registration via PULS beyond the registration period is not possible.

To register an exam, open the PULS website https://puls.uni-potsdam.de and sign in with your account details.

1. Check your notes to know which module you assigned the course packet to that you want to register an exam for
2. Click "My modules" → Choose "Compulsory modules", "Elective modules A", "Elective modules B" or "Advanced modules"
3. Choose the module you want to register an exam for
4. A list of courses and exams that are possible to be registered in this module appear
5. Choose the exam suited for your course packet (ask your professor for the exact name or number if there is any confusion)
6. Click on "Anmelden"
7. Enter the required TAN number and click "Anmelden"

3.5. iTAN list and further information

To sign up to anything in the course of your studies, you need valid iTANs. At the beginning of your studies, you receive an iTAN list. Every time you use an iTAN, it can't be used again. Cross it off your list so you know how many you have left. Make sure you keep at least two iTANs to generate a new iTAN list. You can do this via PULS under "iTAN management".

The University administration furthermore offers **3 videos on YouTube designed for students explaining how to use PULS** in detail (with German and English subtitles):

1. **General introduction to PULS:** where to find courses, how to register for them and how to generate a new iTAN list: https://youtu.be/dm58uoyyI9A
2. A more **in depth look at building your course schedule:** how to read your degree progress plan and the module descriptions, how to reserve and register for courses and which deadlines to consider when withdrawing from them: https://www.youtube.com/watch?v=gj3SXUsjuRI
3. A breakdown in English of some of the **specifics for international program students:** https://youtu.be/FTLUjGFvJi0

4. Course packet contents

The sections below include detailed descriptions for compulsory modules (4.1), course packets for the electives from area A (4.2) and area B (4.3), specialization modules (4.4) and facultative courses (4.5).

4.1. Compulsory modules

BIO-O-KM1: State of the art in ecology, evolution, and conservation	Number of credit points (CP): 6
Module type (compulsory or elective):	Compulsory module
Content and objective of module:	**Content:** Reinforcing knowledge and overview of trends in research in the disciplines ecology, evolution and conservation **Qualification goals:** Students will learn about specific topics and ongoing research in the three disciplines ecology, evolution and science-based conservation. The three lectures cover all aspects of these disciplines, plants and animals, and build on pre-knowledge. The module reinforces principles and current knowledge. The lectures cover a wide range of topics, e.g. food webs, biological invasions, ecological relationships between species, global biodiversity patterns, variation and selection, coevolution, species concepts, global change, population dynamics and viability. Students will get an in-depth knowledge of ecology, evolution and science-based conservation, as well as insights into modern developments of methodology and current research in these three disciplines. They will be trained in interdisciplinary thinking and approaches.
Module examination:	Written exam (180min)
Independent study time (in hours (h)):	60

Courses (type of teaching)	Contact time (in semester hours)	Supplementary exam work (number, form, scope)		Course-related (partial) module examinations (number, form, scope)	Total work required (CP)
		For completing the module	For admission to the module exam		
Lecture State of the Art Ecology	2	-	-	-	
Lecture State of the Art Evolution	2	-	-	-	
Lecture State of the Art Conservation	2	-	-	-	
Excursions offered by the IBB	30 h (= 1 CP)	Certificate	Excursions offered by the IBB*		

Offered	Winter semester (lecture SOTA Evolution), summer semester (lecture SOTA Ecology, lecture SOTA Conservation), winter and summer semester (excursions)
Prerequisite for taking the module	Pre-knowledge of basic ecology is essential, pre-knowledge of basic mathematics (i.e. how to interpret equations) is advised
Teaching units	IBB, Prof. Dr. Linstädter

* Please find excursion dates and information in the following Moodle courses:

- Information for MOEN und MEEC https://moodle2.uni-potsdam.de/course/view.php?id=17039 (no password necessary)
- Tierökologische Exkursionen: https://moodle2.uni-potsdam.de/course/view.php?id=24434 (password: animalexcursions2021)

To finish the module and receive your grade, you have to hand in an excursion card that certifies you have completed 30 hours of excursions. Bring this card to every excursion to get it signed by the teacher. Printable version at https://www.uni-potsdam.de/en/meec/forms

BIO-O-KM2: Experimental design and data analysis	Number of credit points (CP): 6
Module type (compulsory or elective):	Compulsory module
Content and objective of module:	**Content:** Mathematical and conceptual foundations of statistical data analysis **Qualification goals:** Students learn about experimental study design and the appropriate statistical methods for analyzing different types of data. The first half of the course builds a solid foundation, covering an introduction to statistical analysis and the most important basic tests: t-test, one-way ANOVA, chi-square test, linear regression and correlation, and non-parametric equivalents of these tests. Additionally, common issues such as how to test data for normality and different data transformations are covered. The second half of the course starts with an introduction to statistical analysis using the software packet R. This program is used for an array of more challenging and advanced approaches: multiple regression, two-way ANOVA, mixed effects models, logistic regression, principal component analysis, and cluster analysis.
Module examination:	Written exam (120min)
Independent study time (in hours (h)):	90

Courses (type of teaching)	Contact time (in semester hours)	Supplementary exam work (number, form, scope)		Course-related (partial) module examinations (number, form, scope)	Total work required (CP)
		For completing the module	For admission to the module exam		

Lecture	2		Lecture		
Excercises	2		Excercises		

Offered	Winter semester (lectures/exercises)
Prerequisite for taking the module	Some pre-knowledge of basic mathematics (i.e. how to interpret equations) is advised
Teaching units	IBB, Prof. Dr. Zurell

4.2 Electives (6LP) from Area A

→ See the last row of each course packet description or table 3 to know, which elective module you can assign your credit points/ course packet to.

4.2.1 Course packets starting in winter semester

→ See the last row of each course packet description or table 3 to know, which elective module you can assign your credit points/ course packet to. 4.2.1 Course packets starting in winter semester **Basics in limnoecology**	Number of credit points (CP): 6

Module type (compulsory or elective):	Course packet for an elective module
Content and objective of module:	**Content:** This course packet provides a solid introduction into all fields of limnology. It starts with the origin and distribution of freshwater systems, their characteristics and their biological components. Based on this, themes around eutrophication, food webs, seasonality and effects of climate change will be presented. Furthermore, selected applied issues such as limnology of reservoirs, EU Water Framework Directive, acidic mining lakes will be included. Microscopical exercises on phyto- and zooplankton complement this module Qualification goals: The students learn basic and modern themes in limnology. They understand complex food web structures and dynamics and their response to environmental change
Packet examination (number, form, scope):	Written exam (120 min)

Independent study time (in hours (h)):	105

Courses (type of teaching)	Contact time (in semester hours)	Supplementary exam work (number, form, scope)		Course-related (partial) module examinations (number, form, scope)	Total work required (CP)
		For completing the module	For admission to the module exam		
Aquatic Ecology I	2				3
Aquatic Ecology II plus Microscopical Exercises	3				3

Offered	Winter semester
Prerequisite for taking the module	None
Teaching units	IBB, Prof. Dr. Guntram Weithoff
Assignable to PULS-elective module	BIO-O-WM1: Organismic ecology BIO-O-WM2: Basics of ecology BIO-O-WM3: Concepts of ecology BIO-O-WM8/9: Ecology of specific habitats I and II BIO-O-WM10: Aquatic environmental Ecology

Basic theoretical ecology	Number of credit points (CP): 6
Module type (compulsory or elective):	Course packet for an elective module
Content and objective of module:	**Content:** This course offers students an introduction to the field of theoretical ecology. The course combines lectures, to provide the foundational concepts of ecological modelling, with computer exercises that provide hands-on experience. The course will use both pen-and-paper approaches and modern simulation techniques, introducing students to a selection of programming languages (MatLab, R, Python) that are widely used in theoretical ecology and beyond. In addition to exploring the classic models in theoretical ecology, students will develop their own small research project to gain own experience in conducting modelling studies, and put everything learned in the lectures and exercises into practice. **Qualification goals:** The students are introduced to the classic models of theoretical ecology, and learn various modelling techniques for developing, analyzing and interpreting ecological models.

Packet examination (number, form, scope):	Written exam (120 min)
Independent study time (in hours (h)):	90

Courses (type of teaching)	Contact time (in semester hours)	Supplementary exam work (number, form, scope)		Course-related (partial) module examinations (number, form, scope)	Total work required (CP)
		For completing the module	For admission to the module exam		
Lecture + exercises on the subject of theoretical ecology	3				
Computer lab numerical modelling: practical exercises combined with lectures and/or seminars (block course or in parallel with lectures)	3	Report (ca. 15 pages)			

Offered	Winter semester
Prerequisite for taking the module	None
Teaching units	IBB, Dr. Klauschies
Assignable to PULS-elective module	BIO-O-WM2: Basics of ecology BIO-O-WM3: Concepts of ecology BIO-O-WM15: Theoretical ecology and ecological modelling I BIO-O-WM16: Theoretical ecology and ecological modelling II

Experimental plankton ecology	Number of credit points (CP): 6
Module type (compulsory or elective):	Course packet for an elective module
Content and objective of module:	**Content:** The participants study in small groups of 3-4 students modern themes in plankton ecology (phytoplankton and zooplankton). We will address actual research questions by using a broad set of techniques such as fluorescence microscopy, flow cytometry, PAMfluorometry etc. Typical topics are ecophysiology, competition, maternal effects, behavioural ecology or meta-community ecology. The work is directly connected to ongoing research in the group and provides a deep insight into practical work in aquatic ecology. A seminar is included to further discuss the research questions.

	Qualification goals: The students learn to plan, conduct and analyse experiments, to discuss their results and to write a scientific protocol.
Packet examination (number, form, scope):	Protocol (15 pages)
Independent study time (in hours (h)):	90

Courses (type of teaching)	Contact time (in semester hours)	Supplementary exam work (number, form, scope)		Course-related (partial) module examinations (number, form, scope)	Total work required (CP)
		For completing the module	For admission to the module exam		
Practical Course: Plankton Ecology Seminar included	6	Active participation in the seminar			6

Offered	Winter semester
Prerequisite for taking the module	None
Teaching units	IBB, Prof. Dr. Guntram Weithoff
Assignable to PULS-elective module	BIO-O-WM1: Organismic ecology BIO-O-WM5: Data acquisition and analysis BIO-O-WM6: Experimental Ecology BIO-O-WM8/9: Ecology of specific habitats I or II BIO-O-WM10: Aquatic environmental Ecology

Anthropology	Number of credit points (CP): 6
Module type (compulsory or elective):	Course packet for an elective module
Content and objective of module:	**Content:** Anthropologische/humanbiologische Grundkonzepte in Ontogenese und Phylogenese des Menschen, Anthropologische Übung **Qualification goals:** Planung und Durchführung anthropologischer Untersuchungen, experimentelles Design, Aufarbeitung wissenschaftlicher Ergebnisse, Vortragsübung

Packet examination (number, form, scope):	Written exam (60 min.), talk (15 min.)
Independent study time (in hours (h)):	110

Note: Courses are taught in German and English!

Courses (type of teaching)	Contact time (in semester hours)	Supplementary exam work (number, form, scope)		Course-related (partial) module examinations (number, form, scope)	Total work required (CP)
		For completing the module	For admission to the module exam		
Vorlesung Grundlagen der Humanbiologie* (falls V schon belegt- alternativ: humanethologisches Projekt nach Ansprache)	2			Klausur (Bericht über Projekt)	3
Literature Seminare (engl)	1			2 Vorträge (15 min)	2
Anthropologische Übung aus dem Angebot der Humanbiologie	1		Praktikums-bericht		1

Offered	Every summer and winter semester: Grundlagen der Humanbiologie Every winter semester: literature seminar Completion of the entire course may need >1 year!
Prerequisite for taking the module	None
Teaching units	IBB, PD Dr. Scheffler
Assignable to PULS-elective module	BIO-O-WM 1: Organismic ecology BIO-O-WM4: Applied ecology BIO-O-WM 14: Ecology of mammals

Behavioural Ecology	Number of credit points (CP): 6
Module type (compulsory or elective):	Course packet for an elective module
Content and objective of module:	**Content:** Basic concepts of animal ecology and behavioural ecology: heterotrophy, foraging theory, optimisation, landscape of fear, life history and ecology, applied animal ecology, effects of urbanisation, a small behavioural project within the lecture, recent

	research in seminar, consolidation of selected aspects in literature seminar / conference **Qualification goals:** Concepts and Theory, soft skills: presentation in literature seminar / organisation of a conference / exercises in cognition ecology
Packet examination (number, form, scope):	Oral exam (30 min.)
Independent study time (in hours (h)):	90

Courses (type of teaching)	Contact time (in semester hours)	Supplementary exam work (number, form, scope)		Course-related (partial) module examinations (number, form, scope)	Total work required (CP)
		For completing the module	For admission to the module exam		
Lecture „Animal Ecology“	3	-	-		
Seminar „Current topics in animal ecology and human biology“	1	-	-		
Block course „Literature Seminar“ (Stiegler)	2	-	-		

Offered	Lecture winter semester, block course winter semester during semester break (March), seminar “Current topics…” each semester
Prerequisite for taking the module	None
Teaching units	IBB, Prof. Dr. Eccard, Dr. Stiegler
Assignable to PULS-elective module	BIO-O-WM 1: Organismic ecology BIO-O-WM 2: Basics of ecology BIO-O-WM 3: Concepts of ecology BIO-O-WM4: Applied ecology BIO-O-WM 14: Ecology of mammals

Macroecology and global change	Number of credit points (CP): 6
Module type (compulsory or elective):	Course packet for an elective module

Content and objective of module:	**Content:** This packet provides an introduction into the field of macroecology. The participants will get introduced to concepts and methods in modern macroecological and quantitative biodiversity research. Based on a broad range of contemporary international literature, they will learn about observed and expected biodiversity response to global change, and international efforts to conserving biodiversity. In a mix of lectures and exercises, the participants will learn different macroecological analyses and species distribution modelling. All analyses will be carried out within the R software environment. The participants will apply the gained theoretical and methodological knowledge to case studies and solve practical problems related to macroecology and global change. **Qualification goals:** - Basic understanding of macroecological concepts, spatial ecology, and quantitative biodiversity research. - Overview of concurrent international literature on global change impacts on biodiversity. - Advanced data analyses in R, advanced statistical skills (different statistical methods like GLM, GAM, CART), GIS functionality in R - Presentation of scientific results
Packet examination (number, form, scope):	Seminar paper (15 pages) OR Oral exam (30 min)
Independent study time (in hours (h)):	90

Courses (type of teaching)	Contact time (in semester hours)	Supplementary exam work (number, form, scope)		Course-related (partial) module examinations (number, form, scope)	Total work required (CP)
		For completing the module	For admission to the module exam		
Lecture	2	-	-		2
Seminar	2	75% homeworks, final presentation (10 min)	-		2
Excercise	2	-	-		2

Offered	Winter semester
Prerequisite for taking the module	Previous knowledge in R. Knowledge in statistics recommended e.g. from Compulsory Module BIO-O-KM2
Teaching units	IBB, Prof. Dr. Zurell

Assignable to PULS-elective module	BIO-O-WM4: Applied ecology BIO-O-WM 11: Conservation biology BIO-O-WM12: Applications in nature conservation BIO-O-WM15: Theoretical ecology and ecological modelling I BIO-O-WM16: Theoretical ecology and ecological modelling II

Ecology of the Mediterranean vegetation	Number of credit points (CP): 6
Module type (compulsory or elective):	Course packet for an elective module
Content and objective of module:	**Content and qualification goals:** - Extension of knowledge of botanic-taxonomical, phytogeographical and ecological correlations and the problems of nature conservation in an example of the Mediterranean region - Extension of knowledge of botanical structures and taxa - Planning, realization and analysis of an ecological field experiment - Realization of team work - Realization of literature search - Presentation of scientific results
Packet examination (number, form, scope):	Project report (ca. 15 pages)
Independent study time (in hours (h)):	70

Note: Courses are taught in German!

Courses (type of teaching)	Contact time (in semester hours)	Supplementary exam work (number, form, scope)		Course-related (partial) module examinations (number, form, scope)	Total work required (CP)
		For completing the module	For admission to the module exam		
Seminar (2 days)	1 (block)			Talk (20 min)	
Practical tutorial with excursion part	7 (block)			Protocol (ca. 10pages)	

Offered	End of winter semester: The two-day seminar is preparatory for the practical tutorial with the excursion part. The seminar takes place about 2-4 weeks prior to the practical part.
Prerequisite for taking the module	Recommended is knowledge of basics of botanical structures and taxa
Teaching units	IBB, Dr. Kummer

Assignable to PULS-elective module	BIO-O-WM1: Organismic ecology BIO-O-WM4: Applied ecology BIO-O-WM7: Biodiversity research BIO-O-WM8: Ecology of specific habitats 1 BIO-O-WM9: Ecology of specific habitats 2 BIO-O-WM13: Biology of plants and fungi

Taxonomy and biodiversity of fungi and lower plants	Number of credit points (CP): 6
Module type (compulsory or elective):	Course packet for an elective module
Content and objective of module:	**Content and qualification goals:** - Main features of phylogeny, taxonomy, biodiversity and ecology of cryptogams (algae, fungi, lichen, mosses, ferns) - Extension of knowledge of botanical and mycological structures and taxa - Extension of knowledge of evolution and ecology of lower plants and fungi - Extension of ability for sample preparation and microscope them - Extension of mode of thought and operation in taxonomy and ecology - Realization of literature search - Presentation of scientific results
Packet examination (number, form, scope):	Written exam (90 min)
Independent study time (in hours (h)):	90

Note: Courses are taught in German!

Courses (type of teaching)	Contact time (in semester hours)	Supplementary exam work (number, form, scope)		Course-related (partial) module examinations (number, form, scope)	Total work required (CP)
		For completing the module	For admission to the module exam		
Lecture to biology of fungi and lower plants	2			Written exam	
Seminar / Practical tutorial to morphology, taxonomy and ecology of cryptogams with excursion part*	4			Talk (20 min)	

**To complete the module, the participation on one excursion (4 h) during the winter semester ("Botanisch-ökologische Samstagsexkursionen") is necessary!*

Offered	Winter semester
Prerequisite for taking the module	Recommended is knowledge of basics of botanical structures and taxa

Teaching units	IBB, Dr. Kummer
Assignable to PULS-elective module	BIO-O-WM1: Organismic ecology BIO-O-WM2: Basics of ecology BIO-O-WM7: Biodiversity research BIO-O-WM13: Biology of plants and fungi BIO-O-WM17: interactions ecology, evolution, and genetics

Vegetation ecology of Central Europe	Number of credit points (CP): 6
Module type (compulsory or elective):	Course packet for an elective module
Content and objective of module:	**Content:** In this packet the main features of the vegetation of Central Europa as a result of site conditions on the one hand, and vegetation and land-use history on the other hand are taught. **Qualification goals:** The students will be able to consider complex issues of vegetation ecology in the context of landscape history and the physical properties of landscapes. They will be able to assess Central European vegetation types from a nature conservation perspective. Through teamwork in the practical field course they are able to develop and present scientific facts.
Packet examination (number, form, scope):	Written exam (90 min) or oral exam (20 min)
Independent study time (in hours (h)):	90

Note: Courses are taught in German!

Courses (type of teaching)	Contact time (in semester hours)	Supplementary exam work (number, form, scope)		Course-related (partial) module examinations (number, form, scope)	Total work required (CP)
		For completing the module	For admission to the module exam		
Lecture “Vegetation of Central Europe“	1	-	-	Written or oral exam	
Lecture “Vegetation history of Central Europe”	1			Written or oral exam	
Tutorial and practical field course flora and vegetation, preferably in Central Germany	4 (block)	-	-	Protocol (ca. 10 pages)	

Offered	Every year: winter semester (lectures), summer semester (field course)
Prerequisite for taking the module	Recommended is basic botanical knowledge, especially in plant species characteristics and determination
Teaching units	IBB, PD Dr. Heinken
Assignable to PULS-elective module	BIO-O-WM1: Organismic ecology BIO-O-WM 4: Applied ecology BIO-O-WM 7: Biodiversity research BIO-O-WM 8: Ecology of specific habitats 1 BIO-O-WM 9: Ecology of specific habitats 2 BIO-O-WM 12: Applications in nature conservation BIO-O-WM 13: Biology of plants and fungi

Microevolution	Number of credit points (CP): 6
Module type (compulsory or elective):	Course packet for an elective module
Content and objective of module:	**Content:** Basic principles of population genetics will be taught in an evolutionary framework, including genetic aspects such as inbreeding and drift vs. selection and adaptation. Molecular methods for population assessments will be presented. **Qualification goals:** - Deepening of knowledge in microevolution and species protection, including the use of molecular markers and population genetic data processing - Students can apply molecular techniques (DNA / RNA isolation, PCR, gel electrophoresis, and molecular cloning) and evaluate the data with various software programs. Familiarization with current topics through reading publications in scientific journals - Introduction to and presentation of current topics and self-developed questions and results the students work in a team and can present their results in writing and orally in accordance with scientific standards.
Packet examination (number, form, scope):	Oral exam (20 min)
Independent study time (in hours (h)):	90

Courses (type of teaching)		Supplementary exam work (number, form, scope)	Course-related (partial) module	Total work

	Contact time (in semester hours)	For completing the module	For admission to the module exam	examinations (number, form, scope)	required (CP)
Lecture „Molecular Population Genetics“	1	-	-		
Course/Exercises “Molecular Population Genetics”	5	-	Presentation (20 min) and during at least 90% of the appointments the tasks / exercises are processed / carried out, final protocol (10 pages) is written		

Offered	Winter semester
Prerequisite for taking the module	None
Teaching units	IBB, Prof. Dr. Tiedemann
Assignable to PULS-elective module	BIO-O-WM19: Microevolution

System Ecology and Evolution	Number of credit points (CP): 6
Module type (compulsory or elective):	Course packet for an elective module
Content and objective of module:	**Content:** In the lecture System Ecology (Ecology II) knowledge on the functionalities and properties of natural and anthropogenically influenced ecosystems will be intensified. The focus is on descriptions and properties of communities, factors and mechanisms influencing biodiversity, the mechanisms how biodiversity influences ecosystem functions, mechanisms determining the material and energy flows in ecosystems, the regulation of food webs, comparisons between the structure and functioning of terrestrial and pelagic ecosystems, and human ecology. The lecture „Evolutionary Biology“ covers the historical process leading to the synthetic theory of evolutionary biology as well as the general evolutionary mechanisms and micro- and macroevolutionary processes, illustrated by examples. The interactions between genotype and phenotype as well as molecular evolutionary processes are specifically addressed. Furthermore, molecular techniques applicable to evolutionary research will be introduced. **Qualification goals:** The students gain a better understanding of today's concepts in systems ecology and how and why distinct types of ecosystems function in a particular way. This theoretical

	foundation is used to understand causes, consequences and potential solutions of major environmental problems. They will acquire basic knowledge in evolutionary biology and will be able to understand biological phenomena in an evolutionary context. They will know the central evolutionary mechanisms and processes. They can design experiments to answer questions in molecular evolution. They will be able to use basic terms of evolutionary biology and can seek for additional knowledge in recent text books.
Packet examination (number, form, scope):	Exam on the lectures System Ecology and Evolutionary Biology (120 min)
Independent study time (in hours (h)):	120

Note: Courses are taught in German!

Courses (type of teaching)	Contact time (in semester hours)	Supplementary exam work (number, form, scope)		Course-related (partial) module examinations (number, form, scope)	Total work required (CP)
		For completing the module	For admission to the module exam		
Lecture „System ecology“	2	-	-		
Facultative tutorial for lecture system ecology	2				
Lecture „Evolutionary biology“	2	-	-		

The tutorial is facultative (no extra credit points!)

Offered	System ecology: winter semester (Prof. Ursula Gaedke) Evolutionary Biology: summer semester (Prof. Ralph Tiedemann) - module coordinator
Prerequisite for taking the module	None
Teaching units	IBB, Prof. Dr. Tiedemann (module coordinator) / Prof. Dr. Gaedke
Assignable to PULS-elective module	BIO-O-WM1: Organismic ecology BIO-O-WM2: Basics of ecology BIO-O-WM3: Concepts of ecology BIO-O-WM17: Interaction ecology, evolution, and genetics

Ecological modeling with computer simulations	Number of credit points (CP): 6
Module type (compulsory or elective):	Course packet for an elective module

Content and objective of module:	**Content:** Conception, implementation and evaluation of ecological computer simulation models **Qualification goals:** - Strategies and techniques of modern computer-based modeling approaches in ecology and nature conservation - Development and evaluation methods of simple ecological computer simulation models - Programming basics of modeling
Packet examination (number, form, scope):	Seminar paper (15 pages)
Independent study time (in hours (h)):	120

Courses (type of teaching)	Contact time (in semester hours)	Supplementary exam work (number, form, scope)		Course-related (partial) module examinations (number, form, scope)	Total work required (CP)
		For completing the module	For admission to the module exam		
Programming for ecologists & Introduction to Ecological Modeling (lecture and excercise)	2	-	-		3
Advanced Ecological Modeling (block course, lecture & exercise)	3	-	-		3

Offered	Winter semester
Prerequisite for taking the module	None
Teaching units	IBB, Prof. Dr. Jeltsch
Assignable to PULS-elective module	BIO-O-WM 4: Applied Ecology BIO-O-WM 12: Applications of Nature Conservation BIO-O-WM15: Theoretical ecology and ecological modelling I

Plant ecology	Number of credit points (CP): 6
Module type (compulsory or elective):	Course packet for an elective module

Content and objective of module:	**Content:** Current concepts and specific methods in plant ecology **Qualification goals:** Overview of basic and current research in plant ecology Ability to independently carry out a population biological study In-depth knowledge of scientific planning and design of experiments and their evaluation
Packet examination (number, form, scope):	Written exam (90 min)
Independent study time (in hours (h)):	90

Courses (type of teaching)	Contact time (in semester hours)	Supplementary exam work (number, form, scope)		Course-related (partial) module examinations (number, form, scope)	Total work required (CP)
		For completing the module	For admission to the module exam		
Lecture „Plant Ecology“	2	-	-		
Lecture/ Excercise “Population biology of plants“	4	Seminar paper (12 pages)	-		

Offered	Plant Ecology: weekly lecture in winter semester; Population biology of plants: block course in summer semester. This packet takes two semesters to complete
Prerequisite for taking the module	None
Teaching units	IBB, Prof. Dr. Jeltsch
Assignable to PULS-elective module	BIO-O-WM 1: Organismic Ecology BIO-O-WM 2: Basics of Ecology BIO-O-WM 3: Concepts of Ecology BIO-O-WM 5: Data acquisition and analysis BIO-O-WM 6: Experimental Ecology BIO-O-WM 7: Biodiversity Research BIO-O-WM 13: Biology of Plants and Fungi

Regional and applied nature conservation	Number of credit points (CP): 6
Module type (compulsory or elective):	Course packet for an elective module

Content and objective of module:	**Content:** Challenges and implementations of regional conservation in public authorities and non-governmental organizations. **Qualification goals:** - In-depth knowledge of problems and approaches to concrete nature conservation at the regional level - In-depth knowledge for the conception, implementation and evaluation of data surveys for nature conservation purposes
Packet examination (number, form, scope):	Seminar paper (15 pages)
Independent study time (in hours (h)):	90

Courses (type of teaching)	Contact time (in semester hours)	Supplementary exam work (number, form, scope)		Course-related (partial) module examinations (number, form, scope)	Total work required (CP)
		For completing the module	For admission to the module exam		
Regional aspects of nature conservation (lecture and exercise)	6	Passing a written or oral exam	-		6

This course includes introductory lectures, a 3 week (minimum) internship in public conservation authorities or non-governmental conservation organization, and a final presentation workshop. ***Note: German language is required in most (but not all) internships in Germany. But internships can also be organized abroad.***

Offered	Every semester (course can take two semesters)
Prerequisite for taking the module	A concurrent assignment of the course 'Scientific Nature Conservation' is recommended.
Teaching units	IBB, Prof. Dr. Jeltsch
Assignable to PULS-elective module	BIO-O-WM 4: Applied Ecology BIO-O-WM 7: Biodiversity Research BIO-O-WM 8: Ecology of specific habitats 1 BIO-O-WM 9: Ecology of specific habitats 2 BIO-O-WM 12: Applications of Nature Conservation

Scientific nature conservation	Number of credit points (CP): 6
Module type (compulsory or elective):	Course packet for an elective module

Content and objective of module:	**Content:** Concepts, scientific challenges and current methods of conservation biology. **Qualification goals:** - In-depth knowledge of current topics, methods and research approaches of scientific nature conservation. - Independent processing and presentation of a conservation-relevant scientific topic.
Packet examination (number, form, scope):	Oral exam with questionnaire (30 min)
Independent study time (in hours (h)):	90

Note: all lectures are taught in German *(but lecture 'Scientific basis of nature conservation' ('Wissenschaftliche Grundlagen des Naturschutzes' provides English scripts)****!***

Courses (type of teaching)	Contact time (in semester hours)	Supplementary exam work (number, form, scope)		Course-related (partial) module examinations (number, form, scope)	Total work required (CP)
		For completing the module	For admission to the module exam		
Lecture „Scientific basis of nature conservation" ('Wissenschaftliche Grundlagen des Naturschutzes') **or**	2	Passing a written or oral exam	-		2
Lecture and exercise "Biotope mapping" ('Biotopkartierung') **or**	2	Passing a written or oral exam	-		2
Lecture 'Environmental law in practice' ('Umweltrecht in der Praxis')	2	Passing a written or oral exam			2
Seminar ("Current questions and methods in conservation biology") **or**	4				4
Practical field course	4				4

This module requires (i) one of the lectures, and (ii) either the seminar or the practical field course (block exercise course).

Offered	Summer semester
Prerequisite for taking the module	A parallel assignment of the course 'Regional and Applied Nature Conservation' is recommended.
Teaching units	IBB, Prof. Dr. Jeltsch, PD Dr. Blaum, Dr. Bergholz
Assignable to PULS-elective module	BIO-O-WM 3: Concepts of Ecology BIO-O-WM4 Applied ecology BIO-O-WM7: Biodiversity research BIO-O-WM11 Conservation biology

Analysis of high-throughput sequencing data	Number of credit points (CP): 6
Module type (compulsory or elective):	Course packet for an elective module
Content and objective of module:	**Content:** This module will provide students with theoretical and most importantly practical knowledge about how to handle and analyze high throughput sequencing data. Current techniques and use-cases will be introduced and discussed. The whole module will be in one two-week block course after the end of the semester in the lecture free time. Each day will start with a lecture to introduce concepts and to give the necessary theoretical foundations. The rest of the day the students will be guided through exercises to gain hands-on competences and to deepen their understanding. Work will be done on a remote Linux server using a bash terminal. Computation intensive calculations may be running over night or several days. Students are expected to have basic practical knowledge of Linux and how to use a terminal. The first day will be taken to review and deepen this knowledge. **Qualification goals:** - Professional competence How to use high-throughput sequencing approaches for research and diagnostics. - Methodological competence Basic features and use-cases of current high-throughput sequencing techniques. Nature of the produced data. How to handle and analyze big amounts of data. Current processing methods. - Hands-on competence Working on a Linux server using the terminal. Sequencing data handling. Quality control. Genome and transcriptome assembly. Mapping. Variant calling and effect prediction. Gene expression analysis. Interaction site identification. Genetic mapping. Other current processing methods.
Packet examination (number, form, scope):	Written exam (180 min)
Independent study time (in hours (h)):	90

Courses (type of teaching)	Contact time (in semester hours)	Supplementary exam work (number, form, scope)		Course-related (partial) module examinations (number, form, scope)	Total work required (CP)
		For completing the module	For admission to the module exam		
Lectures	2	-	-		

Exercises	4	-	-		

Offered	Winter semester
Prerequisite for taking the module	Students are expected to have basic practical knowledge of Linux and how to use a terminal.
Teaching units	IBB, Dr. Kappel (AG Prof. Dr. Lenhard)
Assignable to PULS-elective module	BIO-O-WM5: Data acquisition and analysis BIO-O-WM17: Interactions ecology, evolution, and genetics

Astrobiology	Number of credit points (CP): 6
Module type (compulsory or elective):	Course packet for an elective module
Content and objective of module:	**Content:** Astrobiology: a general overview; habitability of planets from geologic/biologic/ecophysiologic and ecological point of view; guidelines of planetary simulation experiments with microorganisms in the lab; planetary analogue field site experiments in Polar Regions/Deserts/ at high altitudes; space experiments on satellites and the International Space Station (ISS); Planetary Protection; Research on Biosignatures/Bio-Traces; space mission concepts **Qualification goals:** - Efficient and successful literature research - Team work on a selected astrobiological topic - Oral Presentation - develop innovative new ideas for astrobiological experiments (in space, in the lab and in the field)
Packet examination (number, form, scope):	Oral presentation exam (15min + up to 30 min discussion) and Protocol (up to 15 pages)
Independent study time (in hours (h)):	120

Courses (type of teaching)	Contact time (in semester hours)	Supplementary exam work (number, form, scope)		Course-related (partial) module examinations (number, form, scope)	Total work required (CP)
		For completing the module	For admission to the module exam		
Lecture „Astrobiology“	2	-	-		3

Seminar „Astrobiology“	2	-	-		3

Offered	End of winter semester (2-weeks block course in March)
Prerequisite for taking the module	Recommended is knowledge on biology, geomicrobiology, ecology, evolution and nature conservation
Teaching units	DLR, Dr. de Vera
Assignable to PULS-elective module	BIO-O-WM3: Concepts of ecology BIO-O-WM8: Ecology of specific habitats I BIO-O-WM9: Ecology of specific habitats II BIO-O-WM17: Interactions ecology, evolution, and genetics

Biogeography	Number of credit points (CP): 6
Module type (compulsory or elective):	Course packet for an elective module
Content and objective of module:	**Content:** - Basics and methods in biogeography and phylogeography - Overview on the biomes and realms of the world (Question: How is biodiversity distributed on earth?) - The macrogenetic structure of the world (Question: What are the geological triggers for the distribution of biodiversity on our planet?) - Island biogeography (Questions: How are location and structure of islands and islands groups influencing their biodiversity? Which general conclusions can be drawn on mainland areas and for nature conservation?) - Influence of environmental gradients on habitats (biotic, abiotic, anthropogenic) (Questions: What has triggered the regional and local patterns of biodiversity? Which influences do human activities have on biodiversity?) Qualification goals: - The students get a comprehensive overview on biodiversity on earth and of their origin and distribution. - The students learn to evaluate and analyse data in a biogeographical context. - The students learn the advanced handling and analysis of biogeographic and ecologic data sets. - The students get a comprehensive overview on the biomes of the earth and learn the analysis of habitats also outside Central Europe. - The students acquire in-depth knowledge for the deduction of nature conservation concepts and a profound overview on several animal groups. - The students analyse and understand the importance of characteristic physiogeographic and socio-economic factors as well as their importance for the regional animal and plant associations (climate, geomorphology, geology, soil science, land use, landscape history, etc.). - The students acquire in-depth knowledge on the fauna and flora of a particular region outside of the northern German plains. They understand

	the interactions between animals and plants in a biogeographic-ecological context.
Packet examination (number, form, scope):	Written exam (90 min)
Independent study time (in hours (h)):	70 if selecting option 2 55 if selecting option 3

Note: This course is taught in German!

Courses (type of teaching)	Contact time (in semester hours)	Supplementary exam work (number, form, scope)		Course-related (partial) module examinations (number, form, scope)	Total work required (CP)
		For completing the module	For admission to the module exam		
Lecture „Biogeography“	2	-	-		
Field course	6	Oral-presentation (10 min)			
Excursion with field course	8	Written report (5-10 pages)	-		

For completing “Biogeography”, the lecture has to be taken; Depending on the student’s interests, they may choose either the (2) field course or the (3) excursion with field course

Offered	Lecture: winter semester; Excursion and field course at the end of the summer semester (September), alternating every year
Prerequisite for taking the module	None
Teaching units	IBB / SGN, Prof. Dr. Schmitt
Assignable to PULS-elective module	BIO-O-WM1: Organismic ecology BIO-O-WM4: Applied ecology BIO-O-WM17: Interactions ecology, evolution, and genetics

Dryland ecology	Number of credit points (CP): 6
Module type (compulsory or elective):	Course packet for an elective module
Content and objective of module:	**Content:** Current challenges, advanced methods and concepts in Arid zone Research **Qualification goals:** Advanced Knowledge of current topics and research approaches Arid zone Research

Packet examination (number, form, scope):	Written exam (120 min)
Independent study time (in hours (h)):	90

Courses (type of teaching)	Contact time (in semester hours)	Supplementary exam work (number, form, scope)		Course-related (partial) module examinations (number, form, scope)	Total work required (CP)
		For completing the module	For admission to the module exam		
Lecture „Dryland Ecology“	2	-	-		
Exercise on advanced methods in Dryland Ecology	4	Exercise Protocol (10 pages)	-		

Offered	Lecture in winter semester, exercise in summer semester
Prerequisite for taking the module	None
Teaching units	IBB, PD Dr. Blaum
Assignable to PULS-elective module	BIO-O-WM1: Organismic ecology BIO-O-WM4 Applied ecology BIO-O-WM5 Data acquisition and analysis BIO-OWM6 Experimental ecology BIO-O-WM7: Biodiversity research BIO-O-WM8 Ecology of specific habitats I BIO-OWM9 Ecology of specific habitats II BIO-O-WM11 Conservation biology

Bioimage analysis and extended phenotyping	Number of credit points (CP): 6
Module type (compulsory or elective):	Course packet for an elective module
Content and objective of module:	**Content:** The module will provide students with a basic understanding of bioimage analysis and extended phenotyping. The students will be familiarized with basic image processing techniques and their applications in biological studies: experimental design, digitizing, segmentation, quantification and statistical analysis. Application-oriented work in

	regard to biological questions are central part of this module. In this module, students will learn: - to apply basic bioimage analyses by using existing tools and basic programming (Python or Matlab) - to read and critically evaluate original scientific literature in English and how to extract essential points - how to resolve biological questions in a team of people with different backgrounds and competences As a result, students will be able to: - present their work to a scientific audience using appropriate media and deal with questions and/or comments in a scientific and technical discussion about their topic - ask concise, to-the-point questions about possible future research directions to follow up a given problem. The lecture and exercise series will focus on bioimage analysis and extended phenotyping to answer current research questions. We will introduce the scientific context and the growing importance of bioimage analysis for faster, more precise and objective phenotyping. Students will learn how to apply basic bioimage techniques using existing tools and programming languages. A special emphasis will be given to current research in plant science. Researchers from the University of Potsdam and the Max Planck Institute for Molecular Plant Physiology will present their work and illustrate technical and biological challenges addressed by bioimage analysis. More current research will be discussed based on original scientific articles about current topics in either bioimage processing or applications in biological sciences. The block practical will be done by working in small groups (teams). Each group will have to answer a biological question following a complete bioimage analysis workflow (image acquisition to statistical analysis and biological discussion). Students with different backgrounds are encouraged to work together. The block practical is only open to students who followed the lecture and exercise series.
Packet examination (number, form, scope):	Written exam (180 min)
Independent study time (in hours (h)):	90

Courses (type of teaching)	Contact time (in semester hours)	Supplementary exam work (number, form, scope)		Course-related (partial) module examinations (number, form, scope)	Total work required (CP)
		For completing the module	For admission to the module exam		
Lecture series	2	-	-		
Exercises	1	-	-		
Block practical	3	-	-		

Offered	Winter semester

Prerequisite for taking the module	None
Teaching units	IBB, Dr. Kappel (AG Prof. Dr. Lenhard)
Assignable to PULS-elective module	BIO-O-WM5: Data acquisition and analysis BIO-O-WM17: Interactions ecology, evolution, and genetics

Conservation Genetics	Number of credit points (CP): 6
Module type (compulsory or elective):	Course packet for an elective module
Content and objective of module:	**Lecture and practical course in conservation genetics.** **Content:** The lecture will give an introduction into Conservation Genetics. Modern methods (e.g. NGS) are likewise covered as will be concepts and problem tackling approaches in Conservation genetics. The lecture also provides information on Wildlife Forensics and modern Biobanking. The practical lab course is divided into two parts, one is the generation of data (small projects), the second one is dedicated to the analysis of data and the interpretation of results. **Qualification goals:** - Students will develop a general understanding of Conservation genetics and the related problems and will learn to conceptualize and to carry out own projects.
Packet examination (number, form, scope):	Written exam (90 min.)
Independent study time (in hours (h)):	180

Note: Courses are taught in German!

Courses (type of teaching)	Contact time (in semester hours)	Supplementary exam work (number, form, scope)		Course-related (partial) module examinations (number, form, scope)	Total work required (CP)
		For completing the module	For admission to the module exam		
Lecture „Conservation genetics“	2	-	-		2
Practical course in conservation genetics	4	-	-		4

Offered	Winter semester

Prerequisite for taking the module	None
Teaching units	IBB / IZW, Prof. Dr. Fickel
Assignable to PULS-elective module	BIO-O-WM2: Basics of ecology BIO-O-WM3: Concepts of ecology BIO-O-WM5: Data acquisition and analysis BIO-O-WM17: Interactions ecology, evolution, and genetics

Natural Disasters in the Anthropocene	Number of credit points (CP): 6
Module type (compulsory or elective):	Course packet for an elective module
Content and objective of module:	**Content:** How natural are natural disasters in the Anthropocene? How can we identify partly man-made disasters? Which sedimentary and biogeochemical cycles have been disturbed to the point that disasters are partly human-induced? Which data and methods can we use to show this? We will address these questions in a seminar that offers both presentations and hands-on computer exercises. Course Objectives: To be competent in methods of quantitative and objective hazard assessments; models and prediction; decision support in natural hazard and risk appraisals. Bei Interesse bzw. Rückfragen wenden Sie sich bitte an den Modulverantwortlichen Prof. Oliver Korup (korup@uni-potsdam.de).
Packet examination (number, form, scope):	
Independent study time (in hours (h)):	

Note: Courses are taught in German!

Courses (type of teaching)	Contact time (in semester hours)	Supplementary exam work (number, form, scope)		Course-related (partial) module examinations (number, form, scope)	Total work required (CP)
		For completing the module	For admission to the module exam		
Lecture					6
Exercise					

Offered	Winter semester
Prerequisite for taking the module	None
Teaching units	IBB, Prof. Dr. Korup, Geoökologie
Assignable to PULS-elective module	BIO-O-WM4: Applied Ecology BIO-O-WM12: Applications of nature conservation

Terrestrial palaeoecology	Number of credit points (CP): 6
Module type (compulsory or elective):	Course packet for an elective module
Content and objective of module:	**Content:** Students will gain an understanding of changes in Arctic ecosystems in space and time, with a special focus on the late Pleistocene and Holocene. Students learn basic methods in paleoecology and paleogenetics/environmental genetics and apply these methods in the laboratory. For this purpose, students carry out a paleoecological analysis of a lake sediment core as a case study during a two-week block course. Different methodological approaches are pursued which include DNA analysis from sediments and microfossil analysis (pollen, diatoms). The DNA analysis includes DNA isolation from sediments, polymerase chain reaction (PCR) and gel electrophoresis. DNA data analysis will be done using pre-existing DNA sequence data with a focus of vegetation and diatom compositional signals. Students use the results of the paleoecological/genetic data to reconstruct the history of the environment in a case study. Based on preparatory phases and small group discussions, students deepen basic skills in the preparation and presentation of lectures and posters. **Qualification goals:** - Understanding changes in ecosystems in space and time. Knowledge of basic concepts and methods of paleoecology and paleo / environmental genetics - Introduction to methodical work with sediment cores. - Deepening of the soft skills for poster creation and presentation, as well as development, preparation and presentation of a case study.
Packet examination (number, form, scope):	Oral presentation of a scientific article (10 min) and creationand oral presentation of a scientific poster (15min) which present a case study in the field of terrestrial paleoecology
Independent study time (in hours (h)):	100h

Courses (type of teaching)		Supplementary exam work (number, form, scope)	Course-related (partial) module	Total work

	Contact time (in semester hours)	For completing the module	For admission to the module exam	examinations (number, form, scope)	required (CP)
Lecture on paleoecology	2	-	-		
Seminar	2	-	-		
Practical tutorial	2	-	-		
Offered	End of each winter semester (14 days / block course!). **WS 25/26:** The block course will be from 16.02.26 - 27.02.26 in Englisch				
Prerequisite for taking the module	None				
Teaching units	IBB / AWI, Prof. Dr. Urike Herzschuh, AWI, Dr. Kathleen Stoof-Leichsenring				
Assignable to PULS-elective module	BIO-O-WM1: Organismic ecology, BIO-O-WM2: Basics of ecology, BIO-O-WM3: Concepts of ecology, BIO-O-WM17: Interactions ecology, evolution, and genetics				

4.2.2 Course packets starting in summer semester

Advanced theoretical ecology	Number of credit points (CP): 6
Module type (compulsory or elective):	Course packet for an elective module
Content and objective of module:	**Content:** This course is ideal for students interested in ecological theory. Students are introduced to advanced models and concepts in theoretical ecology, as well as state-of- the art approaches in modelling, that are highly relevant for current research. A combination of lectures and hands-on exercises are used to give students a strong grasp of the theoretical background. Advanced simulation techniques using modern programming languages (R, Python, C/C++) will be introduced and used to explore more complex and ecologically relevant models. Additionally, this course will introduce various sophisticated data analysis techniques (e.g. spectral analysis using Fourier or Wavelet analysis). Students will develop their own research project to gain own experience in conducting modelling studies, and put everything learned in the lectures and exercises into practice. **Qualification goals:** The students learn… - state-of-the-art techniques for the analysis of advanced ecological models - modern methods of data analysis - methods for confronting simulated model dynamics with ecological data

Packet examination (number, form, scope):	Written exam (120 min) **or** oral exam (30 min)
Independent study time (in hours (h)):	90

Courses (type of teaching)	Contact time (in semester hours)	Supplementary exam work (number, form, scope)		Course-related (partial) module examinations (number, form, scope)	Total work required (CP)
		For completing the module	For admission to the module exam		
Lecture + exercises on the subject of theoretical ecology	2 - 4				
Computer lab numerical modelling: practical exercises combined with lectures and/or seminars (block course or in parallel with lectures)	2 - 4	Report (ca. 15 pages)			

Offered	Summer semester
Prerequisite for taking the module	It is recommended that students take the Basic Theoretical Ecology module first
Teaching units	IBB, Dr. Guill
Assignable to PULS-elective module	BIO-O-WM3: Concepts of ecology BIO-O-WM15: Theoretical ecology and ecological modelling I BIO-O-WM16: Theoretical ecology and ecological modelling II

Aquatic Field ecology	Number of credit points (CP): 6
Module type (compulsory or elective):	Course packet for an elective module
Content and objective of module:	**Content:** In this course packet, a field course is combined with a seminar part (within the two weeks). The students will learn how field samples are taken and how they are subsequently processed in the lab. The focus is on characteristic limnological parameter such nutrients, phytoplankton, zooplakton and abiotic variables. The goal is to understand the interplay of these variables **Qualification goals:**

	The students learn to characterize the status a water body (lake) based on relevant limnological variables.
Packet examination (number, form, scope):	Protocol (ca. 15 pages)
Independent study time (in hours (h)):	105

Courses (type of teaching)	Contact time (in semester hours)	Supplementary exam work (number, form, scope)		Course-related (partial) module examinations (number, form, scope)	Total work required (CP)
		For completing the module	For admission to the module exam		
Limnological field course (practical course) includes a seminar	6			Protocol (ca. 15 pages)	6

Offered	Summer semester
Prerequisite for taking the module	None
Teaching units	IBB, Prof. Dr. Guntram Weithoff
Assignable to PULS-elective module	BIO-O-WM3: Concepts of ecology BIO-O-WM8/9: Ecology of specific habitats I and II BIO-O-WM10: Aquatic environmental Ecology

River and Ocean Ecology	Number of credit points (CP): 6
Module type (compulsory or elective):	Course packet for an elective module
Content and objective of module:	**Content:** This module comprises lectures in River Ecology and Marine Ecology (2 CP each), one field exercise (2 CP), one excursion (1 CP) and one exercise (1 CP). The lecture River Ecology is divided into three major parts: 1. A broad overview of the main physical, chemical and biological characteristics of streams and rivers will be given, 2. Human impacts on river ecosystems will be considered, and 3. River ecosystem management and conservation approaches will be discussed. The lecture Marine Ecology will first provide an overview on basic physical, chemical and biological factors of marine ecosystems. In a second step, the lecture Marine Ecology will deal with human impacts and major threats such as plastic pollution, harmful algal blooms, overfishing or climate change and will present threat-related management approaches.

	During the field exercise and excursion, relevant measurements in the field of river ecology will be demonstrated on site. The goal of the exercise on science communication is to learn how scientific results can be made accessible to the (non-scientific) public as short Twitter news, as lay summary and as graphical abstracts, using literature examples from river and marine ecology. **Qualification goals:** The students learn basic and modern themes in river and marine ecology. They understand complex interactions of the biota with the abiotic environment and the response to environmental change. The students gain a comprehensive overview on human impacts, management and conservation approaches in river and marine ecosystems. Furthermore, the students learn basic methods of field sampling in river ecology and how to communicate scientific results to the public.
Packet examination (number, form, scope):	Written exam 2 * 60 min **2 exams must be credited as a minimum, the remaining 2 CP can be achieved variably (see possible combinations below).**
Independent study time (in hours (h)):	Ca. 100, depending on the combination chosen

Courses (type of teaching)	Contact time (in semester hours)	Supplementary exam work (number, form, scope)		Course-related (partial) module examinations (number, form, scope)	Total work required (CP)
		For completing the module	For admission to the module exam		
Lecture “River ecology“	2	-	-	Written exam (60 min)	2
Lecture “Marine ecology“	2	-	-	Written exam (60 min)	2
Field exercise “Potsdam Sacrow - Fish monitoring”	2	Exercise protocol (10 pages)	-	-	2
Excursion “Stechlinsee – 2 days”	1	-	-	-	1
Exercise “Science communication”	1	-	-	-	1

Two possible combinations for this module:
1.) L “River ecology“ + L “Marine ecology“ + Field exerc. „Potsdam Sacrow - Fish monitoring“;
2.) L “River ecology“ + L “Marine ecology“ + *Exc. “Stechlinsee - 2 days“ + *Exerc. “Science communication“
* Students who miss the excursion or exercise can substitute one of those with regular and documented attendance of the lecture series “Current topics in Aquatic Ecology”.

Offered	Summer semester
Prerequisite for taking the module	None
Teaching units	IBB, Prof. Dr. Ehrlich, Prof. Dr. Gaedke, PD Dr. Norbert Kamjunke, PD Dr. Wendt-Potthoff

Assignable to PULS-elective module	BIO-O-WM1: Organismic ecology BIO-O-WM2: Basics of ecology BIO-O-WM3: Concepts of ecology BIO-O-WM8/9: Ecology of specific habitats I and II BIO-O-WM10: Aquatic environmental Ecology

Crop plants and domestic animals	Number of credit points (CP): 6
Module type (compulsory or elective):	Course packet for an elective module
Content and objective of module:	**Content:** This Packet on the one hand biodiversity, history, techniques of plant breeding and plant production, and on the other hand biology of domestic animals and animal husbandry are taught. Practical parts (e.g. excursion) are included. **Qualification goals:** The students will get an understanding of the relationship between biodiversity, cultural history and breeding progress as well as the dependence of plant production on regional climate and soil conditions. They will also have basic knowledge of the biology of important domestic animals and their husbandry. Courses with practical parts include e.g. search, presentation and discussion of scientific facts.
Packet examination (number, form, scope):	Written exam (90 min) **or** oral exam (25 min) (lectures) **and** oral presentation with questioning (30min) (seminar)
Independent study time (in hours (h)):	90

Note: Some courses are taught in German!

Courses (type of teaching)	Contact time (in semester hours)	Supplementary exam work (number, form, scope)		Course-related (partial) module examinations (number, form, scope)	Total work required (CP)
		For completing the module	For admission to the module exam		
Lecture	2+2				
Seminar / practical tutorial	2				

For all PULS-Modules, you need to gather 6 CP. You may select 2 lectures and 1 seminar / practical tutorial

Offered	Summer semester
Prerequisite for taking the module	None

Teaching units	IBB, PD Dr. Heinken
Assignable to PULS-elective module	BIO-O-WM1: Organismic ecology BIO-O-WM 4: Applied ecology BIO-O-WM 13: Biology of plants and fungi BIO-O-WM 14: Ecology of mammals

Ecology and Diversity of Terrestrial Plants	Number of credit points (CP): 6
Module type (compulsory or elective):	Course packet for an elective module
Content and objective of module:	**Content:** This packet combines a practical course with lectures and seminars to deepen both theoretical and practical knowledge in terrestrial plant ecology. In the practical course, small groups of participants (ca. 4) will address actual research questions. Typical topics are from trait-based ecology, biodiversity research, and global change ecology. All students will be integrated in ongoing scientific research projects of the Biodiversity Research/ Systematic Botany group, and collect ecological data in field experiments or sites in/ nearby Potsdam. Examples are the Global Change Experimental Facility close to Halle (Saale), and the Botanical Garden Potsdam. The block course provides a deep insight into practical work in modern plant ecology. Prior to it, a mix of lectures and seminars will help students to familiarize themselves with relevant concepts and methods in modern ecology. After the practical course, lectures and seminars will focus on data analysis and interpretation. **Qualification goals:** **1)** Scientific competences: Students… - Know theories and methods in biodiversity research and global change ecology - Have knowledge of plant phenology and its shift under climate change - Have detailed knowledge about plant functional traits and plant strategies - Have an in-depth knowledge of how plant populations and communities can be affected by climate change and/or land management, and what this means for essential ecosystem functions and services delivered by vegetation - Know how plants can be used as indicators for environmental conditions **2)** Methodological competences: Students… - Understand how scientific questions shape an ecological study design - Know data analysis techniques and can apply them to own data - Are familiar with selected measurement techniques in terrestrial plant ecology - Know important plant species at visited experimental or observational sites - Can integrate their findings with theoretical knowledge obtained in lectures and seminars - Can put data obtained during a practical course into a broader scientific context and critically discuss generated scientific insights - Can write a scientific report (introduction, material & methods, results, discussion, references, supplemental material) similar to a scientific publication

	3) Professional competences: Students… - Know how to effectively organize data collection in a group - Can self-organize consecutive tasks such as data entry and sharing in a group - Know how to effectively organize, visualize and interpret collected data - Are able to condense their results to fit the limited space given - Can utilize feedback provided in scientific discussions or after presentations to improve their work and its interpretation
Packet examination (number, form, scope):	Oral presentation (20 min); report (10 pages); written exam (60 min)
Independent study time (in hours (h)):	90

Courses (type of teaching)	Contact time (in semester hours)	Supplementary exam work (number, form, scope)		Course-related (partial) module examinations (number, form, scope)	Total work required (CP)
		For completing the module	For admission to the module exam		
Ecology and diversity of terrestrial plants (lecture and seminar)	2	-	-	Oral presentation (20 min)	3
Practical field course flora and vegetation along the gradient of site conditions	4	Files with processed field data submitted	-	Report (10 pages), written exam (60 min)	3

Offered	Summer semester
Prerequisite for taking the module	Basic botanical knowledge (especially in plant species characteristics and determination), and knowledge in statistics e.g. from Compulsory Module BIO-O-KM2 is recommended.
Teaching units	IBB, Prof. Dr. Linstädter
Assignable to PULS-elective module	BIO-O-WM1 Organismic ecology BIO-O-WM2 Basics of ecology BIO-O-WM 3 Concepts of ecology Bio-O-WM 4 Applied ecology BIO-O-WM 7 Biodiversity research BIO-O-WM13 Biology of plants and fungi

Geobotany	Number of credit points (CP): 6
Module type (compulsory or elective):	Course packet for an elective module
Content and objective of module:	**Content:** In this packet the relationship between abiotic site conditions (climate, soil and land use) and the present vegetation is taught in theory and practical view, using the example of the Alps. **Qualification goals:** - The students will be able to recognize key factors for phytodiversity and their conservation, deepen their knowledge of plant species. They learn to conduct vegetation records and statistical analyses for basic ecological questions. - Based on literature research the students are able to present geobotanical topics in an appropriate way. Through teamwork in the practical field course they are able to develop and present scientific facts.
Packet examination (number, form, scope):	Oral presentation (30 min) and project report (ca. 20 pages)
Independent study time (in hours (h)):	80

Courses (type of teaching)	Contact time (in semester hours)	Supplementary exam work (number, form, scope)		Course-related (partial) module examinations (number, form, scope)	Total work required (CP)
		For completing the module	For admission to the module exam		
Seminar / lecture Geobotany	2			Oral presentation (30min)	
Practical field course flora and vegetation along the gradient of site conditions	4 (block, Alps)			Project report (ca. 20 pages)	

Offered	Summer semester
Prerequisite for taking the module	Recommended is basic botanical knowledge, especially in plant species characteristics and determination
Teaching units	IBB, PD Dr. Heinken
Assignable to PULS-elective module	BIO-O-WM1: Organismic ecology BIO-O-WM 4: Applied ecology BIO-O-WM 7: Biodiversity research

	BIO-O-WM 8: Ecology of specific habitats 1 BIO-O-WM 9: Ecology of specific habitats 2 BIO-O-WM 12: Applications in nature conservation BIO-O-WM 13: Biology of plants and fungi

Quantitative conservation biogeography	Number of credit points (CP): 6
Module type (compulsory or elective):	Course packet for an elective module
Content and objective of module:	**Content:** This packet provides an introduction into the field of quantitative conservation biogeography. The participants will get introduced to concepts and methods in conservation biogeography and biodiversity monitoring. In a mix of lectures and seminars on contemporary international literature, we will learn about different concepts of basic biogeography, applied island biogeography, systematic conservation planning incl. prioritization, and different monitoring approaches. The packet will also teach practical applications. Specifically, the participants learn to apply occupancy modelling to account for imperfect detection in biodiversity data, and to apply spatially explicit population models for adaptive monitoring and adaptive management. All analyses will be carried out within the R software environment. The participants will apply the gained theoretical and methodological knowledge to case studies and solve practical problems related to quantitative conservation biogeography. **Qualification goals:** - Basic understanding of conservation biogeography, monitoring, and prioritization. - Overview of concurrent international literature on quantitative conservation biogeography. - Advanced statistical skills (applied hierarchical models in R), applications of metapopulation modelling for adaptive monitoring and adaptive management - Presentation of scientific results
Packet examination (number, form, scope):	Seminar paper (15 pages) **or** oral exam (30 min)
Independent study time (in hours (h)):	90

Courses (type of teaching)	Contact time (in semester hours)	Supplementary exam work (number, form, scope)		Course-related (partial) module examinations (number, form, scope)	Total work required (CP)
		For completing the module	For admission to the module exam		
Lecture	2	-	-		2

Seminar	2	-	75% homeworks, final presentation (10 min)		2
Excercise	2	-	-		2

Offered	Summer semester
Prerequisite for taking the module	Previous knowledge in R. Knowledge in statistics recommended e.g. from Compulsory Module BIO-O-KM2.
Teaching units	IBB, Prof. Dr. Zurell
Assignable to PULS-elective module	BIO-O-WM4 Applied Ecology BIO-O-WM11: Conservation biology BIO-O-WM12: Applications in nature conservation BIO-O-WM15: Theoretical ecology and ecological modelling I BIO-O-WM16: Theoretical ecology and ecological modelling II

Experimental Animal Ecology	Number of credit points (CP): 6
Module type (compulsory or elective):	Course packet for an elective module
Content and objective of module:	**Content:** Planning, conducting and analysing ecological field experiment in animal ecology. Concepts and theory and literature, pilot tests, data collection, analysis with R, reports and presentations **Qualification goals:** - concepts and theory - experimental planning and statistical analysis - presentation of results as talk and report - soft skills: group projects, group organisation, time scheduling
Packet examination (number, form, scope):	1 Report (Protocol)
Independent study time (in hours (h)):	30

Courses (type of teaching)		Supplementary exam work (number, form, scope)	Course-related (partial) module	Total work

	Contact time (in semester hours)	For completing the module	For admission to the module exam	examinations (number, form, scope)	required (CP)
12 day block course (2 weeks) at the Biological Station Gülpe	8	-	-		
Seminar Aktuelle Themen in Tierökologie und Humanbiologe	1	-	-		

Offered	Summer semester, block course during semester break (usually in August)
Prerequisite for taking the module	Knowledge in statistics recommended e.g. from Compulsory Module BIO-O-KM2.
Teaching units	IBB, Prof. Dr. Eccard, Dr. Stiegler
Assignable to PULS-elective module	BIO-O-WM1: Organismic ecology BIO-O-WM 4: Applied ecology BIO-O-WM5: Data acquisition and analysis BIO-O-WM6: Experimental Ecology BIO-O-WM 14: Ecology of mammals

The central role of evolutionary biology in biosciences	Number of credit points (CP): 6
Module type (compulsory or elective):	Course packet for an elective module
Content and objective of module:	**Content:** "Nothing makes sense in biology except in the light of evolution.": This module aims at evaluating Dobzhansky's famous phrase by (1) a joint lecture series where different biological disciplines are discussed in the light of evolution, (2) a lecture series dealing with the major disputes/syntheses in evolutionary biology (Lamarckism vs. Darwinism, epigenetics, the modern synthesis, genotypic vs. phenotypic evolution) and a complementary seminar. **Qualification goals:** - Deepening of basic evolutionary knowledge and concepts using current examples - Familiarization with current topics through reading publications in scientific journals - Introduction to and presentation of current topics and self-developed questions and results The students work in a team and can present their results in writing and orally in accordance with scientific standards.
Packet examination	Protocol (ca. 10 pages)

(number, form, scope):	
Independent study time (in hours (h)):	90

Courses (type of teaching)	Contact time (in semester hours)	Supplementary exam work (number, form, scope)		Course-related (partial) module examinations (number, form, scope)	Total work required (CP)
		For completing the module	For admission to the module exam		
Lecture on evolutionary topic	4-2				
Exercises on the role of evolution in biology	2		During at least 90% of the appointments, the given exercises will be completed		
Seminar “Integrative function of Evolutionary Biology”	1		Presentation(15-30 min.) and active participation in at least 90% of the appointments, including writing a standardized short protocol (max. 1 page)		
Seminar „Colloquium in evolutionary biology / genetics“	1		Active participation in at least 90% of the appointments, including writing a standardized short protocol (max. 1 page)		

Offered	Every summer semester (the colloquium can also be taken in winter semesters)
Prerequisite for taking the module	None
Teaching units	IBB, Prof. Dr. Tiedemann, Dr. Marisol Domínguez
Assignable to PULS-elective module	BIO-O-WM18: The Central role of evolutionary biology in biosciences

Agroecology	Number of credit points (CP): 6
Module type (compulsory or elective):	Course packet for an elective module
Content and objective of module:	**Content:** This module teaches the basics of agriculture and how it interferes with biodiversity and environment. Students get to know what motivates farmers and how their activities shape our landscapes and the properties and dynamics of agroecosystems. An excursion is included with the lecture. **Qualification goals:** The students will learn about the growth and development of crops and how it is influenced by soil, weather and management, and about the different drivers and motivations behind farmer's decisions. We will look at the implications of farming activities, and touch on simulation modelling as a tool to further understand and predict agroecosystem dynamics. The Seminar part addresses a range of contemporary conflicts between agriculture and nature protection, which students in responsibility for the content.
Packet examination (number, form, scope):	Lecture: Written exam (75 – 90 min) Seminar: Oral presentation and leading the scientific discussion (45 min)
Independent study time (in hours (h)):	90

Courses (type of teaching)	Contact time (in semester hours)	Supplementary exam work (number, form, scope)		Course-related (partial) module examinations (number, form, scope)	Total work required (CP)
		For completing the module	For admission to the module exam		
Lecture	2			Written exam	3
Seminar	2	Oral lecture, leading the sci. discussion			3

Offered	Summer semester
Prerequisite for taking the module	None
Teaching units	ZALF, Prof. Dr. Nendel
Assignable to PULS-elective module	BIO-O-WM 1: Organismic ecology BIO-O-WM 8: Ecology of specific habitats 1 BIO-O-WM 9: Ecology of specific habitats 2

	BIO-O-WM 12: Applications of Nature Conservation

Genetic and genomic basis of evolutionary change	Number of credit points (CP): 6
Module type (compulsory or elective):	Course packet for an elective module
Content and objective of module:	**Content:** This course examines the processes and patterns occurring at the genomic level that underpin adaptive phenotypic evolution and diversification. Lectures will cover theoretical concepts and methods of analysis, and then show how these can be applied to genome data across a variety of recent case studies. We also carry out discussion groups among student to develop problem-solving skills and provide training for the final exam. During seminars, students will discuss recent scientific papers relevant to the lecuture material. This provides opportunity for informal scientific discussion, which the students can direct towards their own interests and needs. **Qualification goals:** Upon completion, students will be expected to have developed: - a solid understanding of the basic analytical methods applied by genomic studies on adaptive evolution: gene trees, F-statistics, admixture tests, dN/dS ratios - be able to descibe and provide examples of the effects of selection on the genome, including Fst outliers, incongruent gene trees, an excess of non-synonymous substitutions and selective sweeps - exposure to the primary scientific literature, and an ability to understand, interpret and comment on genomics research articles - Have an appreciation of how to design experiments to test evolutionary hypotheses using genomic approaches, considering things like sample size and data requirements
Packet examination (number, form, scope):	Written exam (90 min)
Independent study time (in hours (h)):	120

Courses (type of teaching)	Contact time (in semester hours)	Supplementary exam work (number, form, scope)		Course-related (partial) module examinations (number, form, scope)	Total work required (CP)
		For completing the module	For admission to the module exam		
Lecture series	30h / 2SWS	-	50% tests & homework		Lecture
Seminar	30h / 2SWS	-	-		Seminar

Offered	Summer semester
Prerequisite for taking the module	None
Teaching units	IBB, Prof. Dr. Hofreiter
Assignable to PULS-elective module	BIO-O-WM17: Interactions ecology, evolution, and genetics

Geomicrobiology	Number of credit points (CP): 6
Module type (compulsory or elective):	Course packet for an elective module
Content and objective of module:	**Content:** Basic knowledge of geomicrobiology in terrestrial deposits is taught: The lecture gives an introduction into the world of microorganisms, their importance in global material cycles and biological-geological interactions in relevant habitats. This knowledge will be deepened in the seminar based on selected case studies from current literature. In the practical course (block course) the basic techniques for the investigation of microorganisms are applied to a concrete example. **Qualification goals:** - Basic understanding of microbial life in the geological environment - Prerequisite and limitation of life (processes) in sedimentary deposits - Significance for global material cycles - microbiological and geoscientific fundamentals for the study of life in geological habitats - Introduction to the most important microbiological analysis methods.
Packet examination (number, form, scope):	Written exam (90 min)
Independent study time (in hours (h)):	135

Courses (type of teaching)	Contact time (in semester hours)	Supplementary exam work (number, form, scope)		Course-related (partial) module examinations (number, form, scope)	Total work required (CP)
		For completing the module	For admission to the module exam		

Lecture and seminar	2	-	Presentation with handout		
Practical course	1	-	Protocol		

Offered	Summer semester
Prerequisite for taking the module	None
Teaching units	IBB / GFZ, Prof. Dr. Wagner
Assignable to PULS-elective module	BIO-O-WM1: Organismic ecology BIO-O-WM6: Experimental Ecology BIO-O-WM7: Experimental Ecology

Lake microbiology	Number of credit points (CP): 6
Module type (compulsory or elective):	Course packet for an elective module
Content and objective of module:	**Content:** This packet aims to address the many different theoretical and practical aspects of aquatic microbial ecology. It will be a combination of intense lectures to provide the necessary background knowledge on molecular, physiological and ecological aspects as well as practical field and lab work to get a good hands-on experience. In the field, we will measure selected physical and chemical variables to better evaluate the environmental and biological context of the microorganism community in the respective aquatic environments. In the lab, we will run question-related experiments addressing genetic, physiological and biochemical aspects in microbial ecology. Theoretical and practical exercises will be performed to introduce into the fascination of the microbial world. All students will work on ongoing scientific research projects of the Aquatic Microbial Ecology group at IGB and will get a good insight into a scientist's daily work. This course offers many opportunities to get exposed to field work, intensive hands-on training in generating and analyzing useful microbiological and ecological data. The course takes place at Lake Stechlin. **Qualification goals:** The students learn basic and modern themes in lake microbiology. They understand complex food web structures and dynamics and their response to their environment.
Packet examination (number, form, scope):	Protocol (15 pages)
Independent study time (in hours (h)):	90

Courses (type of teaching)	Contact time (in semester hours)	Supplementary exam work (number, form, scope)		Course-related (partial) module examinations (number, form, scope)	Total work required (CP)
		For completing the module	For admission to the module exam		
Lake microbiology (practical course)	6				3

Offered	Summer semester
Prerequisite for taking the module	None
Teaching units	IBB, Prof. Dr. Grossart
Assignable to PULS-elective module	BIO-O-WM7: Experimental Ecology BIO-O-WM8/9: Ecology of specific habitats I and II BIO-OWM10: Aquatic environmental Ecology

Molecular microbial ecology	Number of credit points (CP): 6
Module type (compulsory or elective):	Course packet for an elective module
Content and objective of module:	**Content:** The lecture Molecular Microbial Ecology gives an overview about the adaptation of microorganisms and the structure of microbial communities in their habitats. A special focus is given to molecular techniques used for the analysis of complex microbial communities, methods aimed to detect activities of microorganisms in situ and microbial genomics and metagenomics. The lecture will cover the role of microorganisms in biogeochemical cycles and the interaction of microorganisms in symbioses and biofilms. In the seminar, original articles complementing topics and molecular technologies introduced in the lecture will be presented and discussed. In the practical tutorial the students will get hands-on experience of molecular techniques for the analysis of microorganisms in their habitats and of microbial communities. **Qualification goals:** 1) Scientific competences: Students - Have a basic understanding of molecular microbial techniques - Have an overview about microbial habitats and metabolic cycles - Know microbial key organisms in different habitats - Have profound knowledge about microbial interactions and biofilms - Have knowledge about adaptation of microorganisms in extreme habitats

	2) Method competences: Students - Know to develop strategies for the analysis of microorganisms in their habitats aimed to understand their metabolic roles - Know principal techniques for the analysis of microorganisms in situ and of microbial communities - Can develop and compare alternative strategies for the analysis of microorganisms and microbial communities and can estimate advantages and disadvantages of techniques - Can put experimental data obtained during a practical course into a broader scientific context and critically discuss their scientific insights - Can relate experimental data to roles of microorganisms in a habitatspecific or metabolic context 3) Action competences: Students - Can present scientific contents related to microbial ecology in an oral or written form - Can design experiments related to microbial ecological questions - Can develop strategies to work on complex problems in collaboration with partners - Utilize feedback provided in scientific discussions or after presentations to improve their work and its interpretation - Can perform experiments according to safety rules in microbial laboratories
Packet examination (number, form, scope):	Written exam (90 min) and protocol (15 pages)
Independent study time (in hours (h)):	80

Courses (type of teaching)	Contact time (in semester hours)	Supplementary exam work (number, form, scope)		Course-related (partial) module examinations (number, form, scope)	Total work required (CP)
		For completing the module	For admission to the module exam		
Lecture „ Molecular Microbial Ecology “	2	-	-	1 written exam (90 min)	3
Seminar „Molecular Microbial Ecology“	1	-	-		1
Practical tutorial “Molecular Microbial Ecology”	2	-	-	1 protocol (15 pages)	2

Offered	Summer semester
Prerequisite for taking the module	Recommended is knowledge on Basic Microbiology and Molecular Biology

Teaching units	IBB, Prof. Dr. Dittmann
Assignable to PULS-elective module	BIO-O-WM1: Organismic ecology BIO-O-WM2: Basics of ecology BIO-O-WM6: Experimental Ecology

Wetland eco-hydrology				Number of credit points (CP): 6
Module type (compulsory or elective):	Course packet for an elective module			
Content and objective of module:	**Content:** This course packet presents the specific features of wetlands from the perspective of various sub-disciplines of geoecology, in particular hydrology and ecology. The module explains fundamental hydrological processes, including interactions between groundwater and surface water, flooding dynamics and runoff formation as well as methods to determine key variables. It also deals with important ecological processes and characteristic vegetation patterns, including the factors that control biodiversity, which is exceptionally high in wetlands. Case studies are presented on the hydrological and ecological functions of wetlands, as well as on the options for sustainable human use and management. Students learn about remote sensing techniques that may be used to analyze the features and functions of wetlands. It links to an introduction of approaches for the assessment of the various ecosystem services that wetlands provide. Supplementing the lectures, we will visit and study a range of regional wetlands in the lowlands of the rivers Havel and Nuthe/Nieplitz **Qualification goals:** 1. Professional competences - Students have specific knowledge and insights into the characteristics of wetlands in different regions. They are able to recognize the structure and functions of wetlands in terms of their general and local characteristics2. Methodological competences. 2. Methodological competence - Students are able to analyze and evaluate a wetland using scientific methods and create development scenarios. They are familiar with selected hydrological measurement techniques3. Action competences. 3. Professional competence - Students are able to structure a disciplinary question of wetland eco-hydrology, and to draft a well-founded disciplinary study on it. They are able to assess the functions and human uses of wetlands, as well as sustainable management options.			
Packet examination (number, form, scope):	Combined exam consisting of reports on the field courses and on the remote sensing seminar (c. 10 pages) and of a written test (90 min)			
Independent study time (in hours (h)):	120			
Note: This course is taught in German!				
Courses (type of teaching)		Supplementary exam work (number, form, scope)	Course-related (partial) module	Total work

	Contact time (in semester hours)	For completing the module	For admission to the module exam	examinations (number, form, scope)	required (CP)
Lecture: Fundamentals of the hydrology and ecology of wetlands and river floodplains	1	-	-		
Field course: Regional features of wetlands and measurement methods	1	-	-		
Field course: Physical habitat mapping of streams	1	-	-		
2 Day excursions: Wetland Eco-Hydrology	1				
Seminar and exercise course: Remote sensing applications	1				

Offered	Summer semester (at least every two years)
Prerequisite for taking the module	Recommended: Hydrology of surface waters
Teaching units	IBB, Geoecology, Dr. Geißler
Assignable to PULS-elective module	BIO-O-WM 4: Applied Ecology BIO-O-WM8/9: Ecology of specific habitats I and II BIO-O-WM10: Aquatic environmental Ecology

4.3 Electives (6LP) from Area B

Elective area B can be filled either by elective modules not yet completed in area A, or by elective modules offered by other departments. Please search the PULS system using the respective module abbreviation to find detailed information about the detailed course content of electives administrated by other institutes and departments at the Faculty of Science (e.g. physics, mathematics, geoecology). See section 3.

4.4 Elective specialization modules (12 LP)

BIO-O-VM1: Plankton ecology	Number of credit points (CP): 12
Module type (compulsory or elective):	Specialization module
Content and objective of module:	**Content:** The students will be introduced to their tentative Master project by running preliminary experiments and by learning biological, chemical and mathematical analyses. The writing of a scientific protocol will be taught as well.

Packet examination (number, form, scope):	Protocol, 15 pages, not graded
Independent study time (in hours (h)):	180

Courses (type of teaching)	Contact time (in semester hours)	Supplementary exam work (number, form, scope)		Course-related (partial) module examinations (number, form, scope)	Total work required (CP)
		For completing the module	For admission to the module exam		
Practical tutorial Plankton Ecology	180	-	-		12

Offered	Every semester
Prerequisite for taking the module	Recommended is knowledge of 12 LP on aquatic ecology
Teaching units	IBB, Prof. Dr. Weithoff

BiO-O-VM2: Animal ecology	Number of credit points (CP): 12
Module type (compulsory or elective):	Specialization module
Content and objective of module:	**Content:** Gaining experience in animal ecology research, data collection, literature research, reports and analysis **Qualification goals:** - Reporting - Communication - Time scheduling
Packet examination (number, form, scope):	Protocol, 15 pages, not graded
Independent study time (in hours (h)):	285

Courses (type of teaching)	Contact time (in semester hours)	Supplementary exam work (number, form, scope)		Course-related (partial) module examinations (number, form, scope)	Total work required (CP)
		For completing the module	For admission to the module exam		
Practical tutorial "Scientific Work in Animal Ecology and Human Biology", including Lab meeting	2	-	-	-	12

Offered	Every semester
Prerequisite for taking the module	Knowledge in statistics recommended e.g. from Compulsory Module BIO-O-KM2
Teaching units	IBB, Prof. Dr Eccard

BIO-O-VM3: Human biology	Number of credit points (CP): 12
Module type (compulsory or elective):	Specialization module
Content and objective of module:	**Content:** Introduction and theoretical orientation phase to scientific work of a concrete project, which is based on ongoing human biological research work **Qualification goals:** - literature research - different methods of data collection and statistical evaluation of the results - Presentation of scientific results
Packet examination (number, form, scope):	Protocol, 15 pages, not graded
Independent study time (in hours (h)):	285

Courses (type of teaching)	Contact time (in semester hours)	Supplementary exam work (number, form, scope)		Course-related (partial) module examinations (number, form, scope)	Total work required (CP)
		For completing the module	For admission to the module exam		

Practical tutorial humanbiological research	360h, supervised: 75h	-	-	-	12

Offered	Every semester
Prerequisite for taking the module	Participation in course packet “Anthropology basic” or “Anthropology advanced”
Teaching units	IBB, PD Dr. Scheffler

BIO-O-VM4: Ecological microbiology	Number of credit points (CP): 12
Module type (compulsory or elective):	Specialization module
Content and objective of module:	**Content:** The module provides in-depth knowledge of ecological microbiology. The students work on current research topics of the working group. Topics in the field of toxic freshwater cyanobacteria, terrestrial symbiotic cyanobacteria or methanogenic archaea can be selected. In particular, the role and diversity of cyanobacterial secondary metabolites is being explored. The student learns and deepens molecular biology techniques for the analysis of complex environmental samples (DNA and RNA analysis), metagenome analyzes, fluorescence microscopy techniques and chemical analysis (HPLC and mass spectroscopy). The student participates in seminars of the working group and learns to interpret research data in the field of ecological microbiology, to critically question them and to develop their own research approaches. **Qualification goals:** 1) Scientific competences. Students… - Have a basic understanding of molecular microbial techniques - Have basic skills in microscopic techniques - Have a basic understanding of chemical analytics using HPLC and mass spectrometry - Have a specific knowledge about the physiology of cyanobacteria or methanogenic archaea - Have bioinformatic skills in microbial genome and metagenome analysis 2) Method competences Students - Know to develop strategies for the analysis of microorganisms in their habitats aimed to understand their metabolic roles - Know principal techniques for the analysis of microorganisms in situ and of microbial communities - Can develop and compare alternative strategies for the analysis of microorganisms and microbial communities and can estimate advantages and disadvantages of techniques - Can put experimental data obtained during a practical course into a broader scientific context and critically discuss their scientific insights

	- Can relate experimental data to roles of microorganisms in a habitatspecific or metabolic context 6) Action competences Students - Can present scientific contents related to microbial ecology in an oral or written form - Can design experiments related to microbial ecological questions - Can develop strategies to work on complex problems in collaboration with partners - Utilize feedback provided in scientific discussions or after presentations to improve their work and its interpretation - Can perform experiments according to safety rules in microbial laboratories
Packet examination (number, form, scope):	Protocol, 15 pages, not graded
Independent study time (in hours (h)):	285

Courses (type of teaching)	Contact time (in semester hours)	Supplementary exam work (number, form, scope)		Course-related (partial) module examinations (number, form, scope)	Total work required (CP)
		For completing the module	For admission to the module exam		
Practical tutorial Ecological Microbiology	360h, supervised: 75h	-	-	-	12

Offered	Every semester
Prerequisite for taking the module	Recommended is knowledge on basic Molecular Biology and Microbiology
Teaching units	IBB, Prof. Dr. Dittmann

BIO-O-VM5: Microbial ecology	Number of credit points (CP): 12
Module type (compulsory or elective):	Specialization module
Content and objective of module:	**Content:** Realization of a small research project, including data analysis, interpretation and documentation. Introduction into the principles of scientific research by carrying out a specific project which is closely related to current research topics in the field of microbial ecology. While the participants are encouraged to contribute to the selection

	of their project topics, the focus of this module is a practical and experimental approach on subjects related to microbial ecology. **Qualification goals:** The participants… - are aware of the strategies and methods to tackle scientific questions in the field of microbial ecology. - are provided with the skill set to connect different stages of scientific work (from the early planning of the project to final documentation of the results), which has been conducted independently by the students. - know how to acquire knowledge through literature study and self-responsible data analysis as well as, how to document and present their results and the ones of others in a scientific way. - get an idea about the work in a scientific research group
Packet examination (number, form, scope):	Protocol, 15 pages, not graded
Independent study time (in hours (h)):	285

Courses (type of teaching)	Contact time (in semester hours)	Supplementary exam work (number, form, scope)		Course-related (partial) module examinations (number, form, scope)	Total work required (CP)
		For completing the module	For admission to the module exam		
Practical tutorial	360h, supervised: 75h	-	Oral presentation (20min)	-	12

Offered	Every semester
Prerequisite for taking the module	None
Teaching units	IBB / GFZ, Prof. Dr. Liebner

BIO-O-VM6: Biodiversity of land plants and fungi	Number of credit points (CP): 12
Module type (compulsory or elective):	Specialization module
Content and objective of module:	**Content and qualification goals:** - Scientific work on a special project

	- Theoretical orientation and project planning - Independent data collection and analysis - Realization of literature search - Documentation and presentation of scientific results
Packet examination (number, form, scope):	Protocol, 15 pages, not graded
Independent study time (in hours (h)):	240

Courses (type of teaching)	Contact time (in semester hours)	Supplementary exam work (number, form, scope)		Course-related (partial) module examinations (number, form, scope)	Total work required (CP)
		For completing the module	For admission to the module exam		
Practical tutorial: realization of a specific scientific project	8	-	-	-	12

Offered	Every semester
Prerequisite for taking the module	Knowledge of basics of botanical structures and taxa
Teaching units	IBB, Dr. Kummer

BIO-O-VM7: Geobotany	Number of credit points (CP): 12
Module type (compulsory or elective):	Specialization module
Content and objective of module:	**Content:** In this module a concrete research project in geobotany is conducted. **Qualification goals:** Strategies and methods to work on scientific questions in the field of geobotany. Students learn to deal with the different phases of a concrete research project (from planning over data collection and data analysis to documentation of the results) both self-contained in in exchange with a scientific working group.
Packet examination	Protocol, 15 pages, not graded

(number, form, scope):	
Independent study time (in hours (h)):	285

Courses (type of teaching)	Contact time (in semester hours)	Supplementary exam work (number, form, scope)		Course-related (partial) module examinations (number, form, scope)	Total work required (CP)
		For completing the module	For admission to the module exam		
Implementation of a research project	-	-	-	-	12

Offered	Every semester
Prerequisite for taking the module	Recommended is knowledge on vegetation ecology and/or geobotany, from module Vegetation Ecology of Central Europe, Geobotany, Plant Ecology, Ecology of the Mediterranean vegetation, or Taxonomy and biodiversity of fungi and lower plants
Teaching units	IBB, PD Dr. Heinken

BIO-O-VM8: Methods in conservation biology	Number of credit points (CP): 12
Module type (compulsory or elective):	Specialization module
Content and objective of module:	**Content:** Advanced methods and knowledge of current research in the field of modern conservation biology. **Qualification goals:** Independent practical and science-based processing of a biological nature conservation problem.
Packet examination (number, form, scope):	Protocol, 15 pages, not graded
Independent study time (in hours (h)):	285

Courses (type of teaching)	Contact time (in semester hours)	Supplementary exam work (number, form, scope)		Course-related (partial) module examinations (number, form, scope)	Total work required (CP)
		For completing the module	For admission to the module exam		
Implementation of a research project	-	-	-	-	12
Offered	Every semester				
Prerequisite for taking the module	Successful completion of at least one of the following modules BIO-O-WM11: Conservation biology or BIO_WM12: Applications of nature conservation				
Teaching units	IBB, Prof. Dr. Jeltsch				

BIO-O-VM9: Modelling in plant ecology and nature conservation	Number of credit points (CP): 12
Module type (compulsory or elective):	Specialization module
Content and objective of module:	**Content:** Advanced methods and knowledge of current research in the field of ecological modeling. **Qualification goals:** Independent practical and science-based processing of a plant-ecological or nature conservation problem by means of computer modeling.
Packet examination (number, form, scope):	Protocol, 15 pages, not graded
Independent study time (in hours (h)):	285

Courses (type of teaching)	Contact time (in semester hours)	Supplementary exam work (number, form, scope)		Course-related (partial) module examinations (number, form, scope)	Total work required (CP)
		For completing the module	For admission to the module exam		
Implementation of a research project	8	-	-	-	12

Offered	Every semester
Prerequisite for taking the module	Successful participation in the module BIO-O-WM15: Theoretical Ecology and Ecological Modeling I or BIO-OWM16: Theoretical Ecology and Ecological Modeling II
Teaching units	IBB, Prof. Dr. Jeltsch

BIO-O-VM10: Arid-zone research	Number of credit points (CP): 12
Module type (compulsory or elective):	Specialization module
Content and objective of module:	**Content:** Advanced methods and knowledge of current research in arid zone research. **Qualification goals:** Independent practical and science-based processing of a challenge or problem in arid zone research.
Packet examination (number, form, scope):	Protocol, 15 pages, not graded
Independent study time (in hours (h)):	285

Courses (type of teaching)	Contact time (in semester hours)	Supplementary exam work (number, form, scope)		Course-related (partial) module examinations (number, form, scope)	Total work required (CP)
		For completing the module	For admission to the module exam		
Implementation of a research project	8	-	-	-	12

Offered	Every semester
Prerequisite for taking the module	Recommended is knowledge on arid zone research / dryland ecology or conservation biology (e.g. lecture, seminar and practical work offered at IBB)
Teaching units	IBB, PD Dr. Blaum

BIO-O-VM11: Data analysis, modelling, and theory in community ecology (alternative A)	Number of credit points (CP): 12
Module type (compulsory or elective):	Specialization module
Content and objective of module:	Note: BIO-O-VM11 can be completed in two alternative ways, A and B. See below for the contents of alternative B. **Content:** The module focusses on practical training (6 weeks as a block or after agreement/ content requirements). It will be based on a small research project, includes a written protocol and contains: - Theoretical familiarization phase, literature research - Introduction to scientific work based on a concrete project, which is based on current research issues - Methods of data analysis, including the development of statistical models and /or simulation models based on ordinary differential equations - Preparation of a final scientific report **Objectives:** 1. Subject-specific competencies: The students: … - show a deeper understanding of theoretical ecological concepts and their implementation in mathematical and / or statistical models - have a good understanding of the integration of more comprehensive ecological data into models, calibration and validation of models - can develop model projections and critically reflect their ecological meaningfulness and reliability - have learned a conceptual and hypothesis-driven way of thinking in research 2. Methodological competencies The students… - are able to understand ecological relationships, to develop new insights and to interpret them adequately - master the theoretical basics in order to develop new, own questions and to implement them in (simulation) experiments - can apply their acquired knowledge to solve given problem tasks - can deal with ecological models, translate scientific facts into mathematical equations and analyse the resulting systems with mathematical, statistical and/or graphical methods - are able to abstract general concepts and mechanisms from complex issues and relationship - gain initial experience in programming with leading statistical and analytical software(e.g. using R, Matlab), - can statistically evaluate results and document them in a scientific protocol. 3. Personal competencies The students… - are able to independently work on scientific issues by identifying the essential information of tasks, structuring them, and derive appropriate conclusions.

	- are able to present ecological facts in a concise form verbally and written - make use of the availability of up-to-date original literature to classify their own hypotheses and answers - are able to use up-to-date statistical and analytical software
Packet examination (number, form, scope):	Protocol, 15 pages, not graded
Independent study time (in hours (h)):	285

Courses (type of teaching)	Contact time (in semester hours)	Supplementary exam work (number, form, scope)		Course-related (partial) module examinations (number, form, scope)	Total work required (CP)
		For completing the module	For admission to the module exam		
Practical training	360h, of which 75h are supervised	-	Protocol	-	12

Offered	Every semester
Prerequisite for taking the module	Both compulsory modules
Teaching units	Module coordinator: IBB, Prof. Dr. Gaedke Execution: IBB, Prof. Dr. Gaedke, Dr. Christian Guill, Dr. Toni Klauschies

BIO-O-VM11: Aquatic ecosystems and conservation – data analysis, modelling and management processes (alternative B)	Number of credit points (CP): 12
Module type (compulsory or elective):	Specialization module
Content and objective of module:	Note: BIO-O-VM11 can be completed in two alternative ways, A and B. See above for the contents of alternative A. **Content:** In this module, the students will work on an individually defined research project related to current topics in aquatic ecology and conservation. Project topics include, for example, maintenance of biodiversity in aquatic ecosystems, sustainable resource management in socio-ecological systems. invasive species, toxic algal blooms, and habitat restoration. The module comprises a practical training in an active research group on how to conduct a research project and involves the following steps: • Familiarization with the topic, literature research

	• Specifying the research question • Introduction to scientific work and the methodology • Implementation of methods, depending on research question: i) data analysis (e.g., data from the field or experimental data), ii) simulation model (e.g., individual-based models or ordinary differential equation models) or iii) designing a management approach (e.g., adaptive management with stakeholder involvement in conservation) • Preparation of a final scientific report (protocol) **Qualification goals:** Upon completion of this module, students will be able to deal with all phases of a research project, starting from specifying the research question, conceptual thinking and literature research - through planning data collection/model development/designing a management approach and their implementation – to the analysis of the results, critical discussion and writing of the scientific report.
Packet examination (number, form, scope):	Protocol, 15 pages, not graded
Independent study time (in hours (h)):	285

Courses (type of teaching)	Contact time (in semester hours)	Supplementary exam work (number, form, scope)		Course-related (partial) module examinations (number, form, scope)	Total work required (CP)
		For completing the module	For admission to the module exam		
Practical training	360h, of which 75h are supervised	-	Protocol	-	12

Offered	Every semester
Prerequisite for taking the module	Both compulsory modules
Teaching units	Module coordinator: IBB, Prof. Dr. Elias Ehrlich Execution: IBB, Prof. Elias Ehrlich

BIO-O-VM12: Evolutionary biology (alternative A)	Number of credit points (CP): 12
Module type (compulsory or elective):	Specialization module
Content and objective of module:	Note: BIO-O-VM12 can be completed in two alternative ways, A and B. See below for the contents of alternative B. **Content:** Introduction to scientific work based on a defined project. Either modeling or empirical / experimental methods can be used. **Qualification goals:** Mediated subject-specific qualifications: Based on a defined project, the module conveys strategies and methods for dealing with scientific questions in evolutionary biology research. The students learn to combine the different phases of a specific scientific work (from planning to documentation) and to work independently. Mediated key qualifications: research, independent editing, documenting, presenting, discussing and scientific writing of specially processed and foreign scientific facts
Packet examination (number, form, scope):	Protocol, 15 pages, not graded
Independent study time (in hours (h)):	285

Courses (type of teaching)	Contact time (in semester hours)	Supplementary exam work (number, form, scope)		Course-related (partial) module examinations (number, form, scope)	Total work required (CP)
		For completing the module	For admission to the module exam		
Implementation of a research project	360h, of which 75h are supervised	-	-	-	12

Offered	Every semester
Prerequisite for taking the module	"The knowledge required for the proper and safe conduct of laboratory equipment must be available for admission to the experimental part." Hence, the elective module BIOOWM19: Microevolution is a prerequisite, if the specialization module contains experimental work. Otherwise: No prerequisite
Teaching units	IBB, Prof. Dr. Tiedemann

BIO-O-VM12: Evolutionary Biology (alternative B)	Number of credit points (CP): 12
Module type (compulsory or elective):	Specialization module “Methods in Conservation genetics“
Content and objective of module:	Note: BIO-O-VM12 can be completed in two alternative ways, A and B. See above for the contents of alternative A. **Components of the module**: - Carrying out of a small research project including - Data acquisition, evaluation and analysis and - written final report ➔ Either 6 weeks en bloc or two days per week per semester **Content and objective** The students will be introduced to organise project work (planning, ordering, executing) based on a real (currently running) research project. This may include both modelling approaches and/or experimental/ empirical methods. **Professional knowledge acquired** Using real (currently running) scientific projects the module teaches strategies and methods applied in evolutionary ecological research. The students will learn how to link the different phases of a project (from planning/data acquisition/analysis to documentation and presentation) and to work on them by themselves. **Key knowledge acquired** Working independently on different phases of a research project, following good scientific practice, interpretation and presentation of one’s own results and discussion of results of others (published articles).
Packet examination (number, form, scope):	Protocol, 15 pages, not graded
Independent study time (in hours (h)):	285

Note: this course is taught in German!

Courses (type of teaching)	Contact time (in semester hours)	Supplementary exam work (number, form, scope)		Course-related (partial) module examinations (number, form, scope)	Total work required (CP)
		For completing the module	For admission to the module exam		
Implementation of a research project	360h, of which 75h are supervised	-	-	-	12

Offered	Every semester
Prerequisite for taking the module	*None*
Teaching units	IBB / IZW, Prof. Dr. Fickel

4.5 Facultative courses (non-credit courses/seminars)

The following courses ("current topics in…") are our research groups seminars. Every research group has their own seminar, where they invite external experts to give presentations or give updates about work in the research group. This is your chance to see science at work, meet exciting researchers, see the state of the art of the field years before it enters the text books. If you are interested to become a researcher in the future GO AND VISIT, independent of the credits. Most seminars are part of a course package, but they can be visited again every semester as there is a fresh program every time. For easy recognition they are all called "**Current topics in**…."

- **Aquatic Ecology**: Continuous seminar (winter and summer semester) on the ecology and ecological modelling of (mostly aquatic) food webs. (AG Gaedke)
- **Theoretical Ecology** (Seminar zur Theoretischen Ökologie): Seminar on ecological theory and modelling. Strong interest in mathematical models is recommended. (AG Gaedke)
- **Biodiversity research** (Oberseminar Aktuelle Themen der Biodiversitätsforschung). (AG Linstädter)
- **Animal Ecology and Human Biology** (Oberseminar AG Eccard)
- **Nature conservation** (AG Jeltsch)

We are currently having a "**joined ecological colloquium**" for all the ecology groups together substituting the "current topics" seminar date once a month.

Further courses offered:

- Field course "Insektenbestimmung" (Freilandkurs Eccard/Scheffler in summer)