

## Pflichtmodule

### BIO.07670.03 - Compulsory module 'Statistics in Biodiversity Sciences'

BIO.07670.03	5 CP
<b>Module label</b>	Compulsory module 'Statistics in Biodiversity Sciences'
<b>Module code</b>	BIO.07670.03
<b>Semester of first implementation</b>	
<b>Module used in courses of study / semesters</b>	<ul style="list-style-type: none"> <li>Biodiversity Sciences (MA120 LP) (Master) &gt; Biologie BiodiversityMA120, Version of accreditation valid from SS 2021 &gt; Pflichtmodule</li> </ul>
<b>Responsible person for this module</b>	
<b>Further responsible persons</b>	Professors of the Institute of Biology
<b>Prerequisites</b>	
<b>Skills to be acquired in this module</b>	<ul style="list-style-type: none"> <li>Proficiently manage and analyse biodiversity data using the statistical programming language R, including data cleaning, manipulation and visualization.</li> <li>Demonstrate a solid understanding of the theoretical principles behind univariate and multivariate statistical methods commonly used in biodiversity sciences and apply these methods to analyse and interpret biodiversity data.</li> <li>Effectively communicate biodiversity data and statistical analyses through data visualization techniques, to effectively convey complex information to diverse audiences.</li> </ul>
<b>Module contents</b>	<ul style="list-style-type: none"> <li>Introduction to the R statistical environment</li> <li>Descriptive statistics and basics of statistical testing</li> <li>Analysis of variance; linear regression; multiple regression; ANCOVA</li> <li>Generalized linear models</li> <li>Linear mixed-effects models and generalized linear mixed effects models</li> <li>Multivariate statistics</li> <li>Spatial statistics</li> <li>Bayesian statistics</li> <li>Interaction networks</li> <li>Structural equation models</li> </ul>
<b>Forms of instruction</b>	Lecture (2 SWS) Exercises (2 SWS) Course
<b>Languages of instruction</b>	German, English
<b>Duration (semesters)</b>	2 Wochen Semester
<b>Module frequency</b>	jedes Wintersemester
<b>Module capacity</b>	unlimited
<b>Time of examination</b>	
<b>Credit points</b>	5 CP
<b>Share on module final degree</b>	Course 1: %; Course 2: %; Course 3: %.
<b>Share of module grade on the course of study's final grade</b>	1
<b>Reference text</b>	The compulsory modules require physical presence. In case of inability to attend (due to illness or other reasons) the lecturer must be notified promptly. To earn course credits, students must not exceed a 10% absence, equivalent to missing one day in a two weeks block module. In case of a longer absence there might be the possibility to compensate for missed days by additional tasks.

Examination		Exam prerequisites			Type of examination			
<b>Course 1</b>								
<b>Course 2</b>								
<b>Course 3</b>								
<b>Final exam of module</b>					Hausarbeit			
<b>Exam repetition information</b>								
Module course label	Course type	Course title	SWS	Workload of compulsory attendance	Workload of preparation / homework etc	Workload of independent learning	Workload (examination and preparation)	Sum workload
<b>Course 1</b>	Lecture	Vorlesung		2				0
<b>Course 2</b>	Exercises	Übung		2				0
<b>Course 3</b>	Course	Selbststudium						0
<b>Workload by module</b>						150		150
<b>Total module workload</b>								150

## BIO.07673.02 - Project Study 'Biodiversity Sciences'

BIO.07673.02 15 CP

**Module label** Project Study 'Biodiversity Sciences'

**Module code** BIO.07673.02

**Semester of first implementation**

**Module used in courses of study / semesters**

- Biodiversity Sciences (MA120 LP) (Master) > Biologie Biodiversity/MA120, Version of accreditation valid from SS 2021 > Pflichtmodule

**Responsible person for this module**

**Further responsible persons** Professors of the Department in which the Master thesis is prepared

**Prerequisites** At least 30 CP (out of 45 CP) from elective project modules; 40 CP (out of 120 CP) are required.

**Skills to be acquired in this module**

- Ability to critically reflect scientific literature
- In-depth knowledge of data analysis
- Methodology of short presentations at scientific conferences
- Mastery of the English technical vocabulary in the subject of the master thesis

**Module contents**

- Active participation in the literature and working group seminars in the subject of the master thesis
- Instructions for working with subject-specific databases such as analyzing genome sequences
- Instructions for handling software and hardware for evaluating analytical data and their critical evaluation
- Presentation and discussion of a scientific lecture

**Forms of instruction**

Course (6 SWS)  
 Course  
 Course  
 Course (1 SWS)  
 Course (1 SWS)  
 Course  
 Course  
 Course (1 SWS)

**Languages of instruction** German, English

**Duration (semesters)** 6 Wochen Semester

**Module frequency** jedes Semester

**Module capacity** unlimited

**Time of examination**

**Credit points** 15 CP

**Share on module final degree** Course 1: %; Course 2: %; Course 3: %; Course 4: %; Course 5: %; Course 6: %; Course 7: %; Course 8: %.

**Share of module grade on the course of study's final grade** 1

Examination	Exam prerequisites	Type of examination
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**Course 1**

**Course 2**

**Course 3**

**Course 4**

**Course 5**

**Course 6**

**Course 7**

**Course 8**

Examination		Exam prerequisites				Type of examination		
<b>Final exam of module</b>						wissenschaftlicher Vortrag		
<b>Exam repetition information</b>								
Module course label	Course type	Course title	SWS	Workload of compulsory attendance	Workload of preparation / homework etc	Workload of independent learning	Workload (examination and preparation)	Sum workload
<b>Course 1</b>	Course	Project seminar 'Collection of scientific data'	6					0
<b>Course 2</b>	Course	Literatur study						0
<b>Course 3</b>	Course	Data analysis						0
<b>Course 4</b>	Course	Working group seminar	1					0
<b>Course 5</b>	Course	Literature seminar	1					0
<b>Course 6</b>	Course	Self study						0
<b>Course 7</b>	Course	Preparation of the presentation						0
<b>Course 8</b>	Course	Colloquium	1					0
<b>Workload by module</b>						450		450
<b>Total module workload</b>								450

## BIO.07674.03 - Final Module 'Master Biodiversity Sciences'

BIO.07674.03 30 CP

**Module label** Final Module 'Master Biodiversity Sciences'

**Module code** BIO.07674.03

**Semester of first implementation**

**Module used in courses of study / semesters**

- Biodiversity Sciences (MA120 LP) (Master) > Biologie BiodiversityMA120, Version of accreditation valid from SS 2021 > Pflichtmodule

**Responsible person for this module**

**Further responsible persons** Professors of the Department in which the Master thesis is prepared

**Prerequisites** At least 25 CP (out of 75 CP) from compulsory modules; at least 30 CP (out of 45 CP) from elective project modules; 55 CP (out of 120 CP) are required.

**Skills to be acquired in this module**

- Ability to plan, carry out, analyse and scientifically document a complex scientific experiment or observational study or modelling study
- Ability to independently produce a written academic paper
- Ability to present and discuss own scientific results

**Module contents**

- Support in working with subject-specific literature and with databases
- Support in handling software and hardware for evaluating analytical data and their critical evaluation
- Support in the scientific presentation of the results obtained
- Presentation and discussion of a scientific lecture

**Forms of instruction**

Course  
Course  
Course  
Course  
Course  
Course

**Languages of instruction** German, English

**Duration (semesters)** 6 Monate Semester

**Module frequency** jedes Semester

**Module capacity** unlimited

**Time of examination**

**Credit points** 30 CP

**Share on module final degree** Course 1: %; Course 2: %; Course 3: %; Course 4: %; Course 5: %; Course 6: %.

**Share of module grade on the course of study's final grade** 1

Examination	Exam prerequisites	Type of examination
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**Course 1**

**Course 2**

**Course 3**

**Course 4**

**Course 5**

**Course 6**

**Final exam of module** Masterarbeit, Verteidigung

**Exam repetition information**

Module course label	Course type	Course title	SWS	Workload of compulsory attendance	Workload of preparation / homework etc	Workload of independent learning	Workload (examination and preparation)	Sum workload
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Course 1	Course	Experimental						0
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Module course label	Course type	Course title	SWS	Workload of compulsory attendance	Workload of preparation / homework etc	Workload of independent learning	Workload (examination and preparation)	Sum workload
		work or literature study						
<b>Course 2</b>	Course	Evaluation of experiments or literature						0
<b>Course 3</b>	Course	Writing the master's thesis						0
<b>Course 4</b>	Course	Preparation of the presentation						0
<b>Course 5</b>	Course	Public presentation and discussion of the thesis						0
<b>Course 6</b>	Course	Self study						0
<b>Workload by module</b>							900	900
<b>Total module workload</b>								900

## BIO.07669.03 - Compulsory module 'Design of Research Studies' (MSc)

BIO.07669.03		5 CP
<b>Module label</b>	Compulsory module 'Design of Research Studies' (MSc)	
<b>Module code</b>	BIO.07669.03	
<b>Semester of first implementation</b>		
<b>Module used in courses of study / semesters</b>	<ul style="list-style-type: none"> <li>Biodiversity Sciences (MA120 LP) (Master) &gt; Biologie Biodiversity/MA120, Version of accreditation valid from SS 2021 &gt; Pflichtmodule</li> </ul>	
<b>Responsible person for this module</b>		
<b>Further responsible persons</b>	Prof. Dr. Helge Bruelheide	
<b>Prerequisites</b>		
<b>Skills to be acquired in this module</b>	<ul style="list-style-type: none"> <li>Understand the importance of formulating clear research questions and aligning them with appropriate study designs and statistical tools.</li> <li>Obtain an overview of research designs for experimental, observational and modelling studies; including their advantages, disadvantages and pitfalls.</li> <li>Demonstrate the ability to critically evaluate different research designs for experimental, observational and modelling studies, and identify their respective strengths, limitations, and potential sources of bias. Gain practical experience in designing research studies through case studies and real-world examples in the field of biodiversity sciences.</li> </ul>	
<b>Module contents</b>	<ul style="list-style-type: none"> <li>Common basics for research design: deductive and inductive methods, data distributions, (non-)independence of samples, (non-)independence (covariation) of environmental variables/treatments (predictors)</li> <li>Design of experimental studies; e.g. factorial, nested, split-plot designs</li> <li>Design of observational studies: different approaches of spatial sampling (point sampling, grid sampling, regular, random, arbitrary, presence-only, presence/absence), temporal sampling (continuous/discontinuous, within year/among years), collinearity among environmental factors</li> <li>Design of modelling studies: conceptual models, phenomenological models, process-based models (cellular automata, differential equations, mechanistic, agent-based models)</li> </ul>	
<b>Forms of instruction</b>	Lecture (2 SWS) Seminar (2 SWS) Course	
<b>Languages of instruction</b>	German, English	
<b>Duration (semesters)</b>	2 Wochen in der Vorlesungsfreien Zeit Semester	
<b>Module frequency</b>	jedes Wintersemester	
<b>Module capacity</b>	unlimited	
<b>Time of examination</b>		
<b>Credit points</b>	5 CP	
<b>Share on module final degree</b>	Course 1: %; Course 2: %; Course 3: %.	
<b>Share of module grade on the course of study's final grade</b>	1	
<b>Reference text</b>	The compulsory modules require physical presence. In case of inability to attend (due to illness or other reasons) the lecturer must be notified promptly. To earn course credits, students must not exceed a 10% absence, equivalent to missing one day in a two weeks block module. In case of a longer absence there might be the possibility to compensate for missed days by additional tasks.	
<b>Examination</b>	<b>Exam prerequisites</b>	<b>Type of examination</b>
<b>Course 1</b>		
<b>Course 2</b>		

Examination		Exam prerequisites				Type of examination		
<b>Course 3</b>								
<b>Final exam of module</b>						Hausarbeit		
<b>Exam repetition information</b>								
Module course label	Course type	Course title	SWS	Workload of compulsory attendance	Workload of preparation / homework etc	Workload of independent learning	Workload (examination and preparation)	Sum workload
<b>Course 1</b>	Lecture	Vorlesung		2				0
<b>Course 2</b>	Seminar	Seminar		2				0
<b>Course 3</b>	Course	Selbststudium						0
<b>Workload by module</b>						150		150
<b>Total module workload</b>								150



## BIO.07672.03 - Research Internship 'Biodiversity Sciences'

BIO.07672.03 15 CP

<b>Module label</b>	Research Internship 'Biodiversity Sciences'
<b>Module code</b>	BIO.07672.03
<b>Semester of first implementation</b>	
<b>Module used in courses of study / semesters</b>	<ul style="list-style-type: none"> <li>Biodiversity Sciences (MA120 LP) (Master) &gt; Biologie Biodiversity/MA120, Version of accreditation valid from SS 2021 &gt; Pflichtmodule</li> </ul>

<b>Responsible person for this module</b>	
<b>Further responsible persons</b>	Professors of the Institute of Biology

<b>Prerequisites</b>	At least 15 CP (out of 45 CP) from elective project modules. Overall 20 CP (out of 120 CP) are required
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<b>Skills to be acquired in this module</b>	<p>Befähigung, eigenständig ein kleines Projekt im Rahmen einer größeren Forschungsarbeit unter Anleitung anzufertigen</p> <p>Befähigung, selbstständig Aufgaben im Rahmen eines Forschungsprojektes zu erkennen, zu strukturieren, auf dieser Grundlage zu arbeiten und Erkenntnisse zu gewinnen</p> <p>Kompetenz in der kritischen Bewertung der eigenen wissenschaftlichen Arbeit</p> <p>Beherrschung eines Komplexes von fachspezifischen Methoden</p> <p>Kritische Auseinandersetzung mit spezieller wissenschaftlicher Literatur</p> <p>Spezielle Kenntnisse der Datenanalyse</p> <p>Fähigkeit, ein wissenschaftliches Protokoll in Form einer englischsprachigen Publikation anzufertigen</p>
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<b>Module contents</b>	<p>Fachspezifische Methoden in Freiland, Gewächshaus und Labor</p> <p>Anleitung zum Umgang mit spezieller Soft- und Hardware zur Auswertung analytischer Daten und deren kritische Bewertung</p> <p>Gemeinschaftliche und problemorientierte Zusammenarbeit mit Wissenschaftlern der Arbeitsgruppen</p> <p>Präsentation der eigenen Daten in Form einer wissenschaftlichen Publikation</p>
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<b>Forms of instruction</b>	<p>Course (10 SWS)</p> <p>Course</p> <p>Course</p> <p>Course (2 SWS)</p> <p>Course</p>
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<b>Languages of instruction</b>	German, English
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<b>Duration (semesters)</b>	6 Wochen Semester
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<b>Module frequency</b>	jedes Semester
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<b>Module capacity</b>	unlimited
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<b>Time of examination</b>	
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<b>Credit points</b>	15 CP
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<b>Share on module final degree</b>	Course 1: %; Course 2: %; Course 3: %; Course 4: %; Course 5: %.
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<b>Share of module grade on the course of study's final grade</b>	1
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Examination	Exam prerequisites	Type of examination
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<b>Course 1</b>	
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<b>Course 2</b>	
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<b>Course 3</b>	
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<b>Course 4</b>	
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<b>Course 5</b>	
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<b>Final exam of module</b>	Protokoll
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<b>Exam repetition information</b>	
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Module course label	Course type	Course title	SWS	Workload of compulsory attendance	Workload of preparation / homework etc	Workload of independent learning	Workload (examination and preparation)	Sum workload

Module course label	Course type	Course title	SWS	Workload of compulsory attendance	Workload of preparation / homework etc	Workload of independent learning	Workload (examination and preparation)	Sum workload
<b>Course 1</b>	Course	Subject-specific methods		10				0
<b>Course 2</b>	Course	Literature research						0
<b>Course 3</b>	Course	Self-study						0
<b>Course 4</b>	Course	Instruction in the preparation of the scientific protocol		2				0
<b>Course 5</b>	Course	Elaboration of the scientific protocol						0
<b>Workload by module</b>						450		450
<b>Total module workload</b>								450

## BIO.07671.02 - Excursions in Botany and Zoology

BIO.07671.02		5 CP
<b>Module label</b>	Excursions in Botany and Zoology	
<b>Module code</b>	BIO.07671.02	
<b>Semester of first implementation</b>		
<b>Module used in courses of study / semesters</b>	<ul style="list-style-type: none"> <li>Biodiversity Sciences (MA120 LP) (Master) &gt; Biologie Biodiversity/MA120, Version of accreditation valid from SS 2021 &gt; Pflichtmodule</li> </ul>	
<b>Responsible person for this module</b>		
<b>Further responsible persons</b>	Professors of the Institute of Biology	
<b>Prerequisites</b>		
<b>Skills to be acquired in this module</b>	<ul style="list-style-type: none"> <li>Developing a deep understanding of the ecological and conservation significance of selected habitats with high diversity and conservation value, such as bogs and dry grasslands, through field-based excursions and hands-on activities.</li> <li>Understanding the design of biodiversity-ecosystem functioning experiments and nature conservation projects.</li> <li>Enhancing species identification skills in the field, including the use of taxonomic keys, field guides and mobile apps for accurate species identification.</li> <li>Gaining proficiency in the determination of zoological and botanical special groups, such as rare or endangered species, cryptic or difficult to identify taxa in expert-led excursions.</li> </ul>	
<b>Module contents</b>	<ul style="list-style-type: none"> <li>Excursions to selected habitats (e.g. porphyry outcrops close to Halle)</li> <li>Excursions to selected nature conservation projects</li> <li>Excursions to biodiversity-ecosystem functioning experiments (e.g. BIOTREE tree diversity experiments in Bechstedt)</li> <li>Excursions to protected areas (e.g. Müritzer National Park)</li> <li>Identification exercises in the field with follow-up work</li> <li>Imparting practical field methods and skills for the identification of species</li> </ul>	
<b>Forms of instruction</b>	Study trip (4 SWS) Course	
<b>Languages of instruction</b>	German, English	
<b>Duration (semesters)</b>	1 Semester Semester	
<b>Module frequency</b>	jedes Sommersemester	
<b>Module capacity</b>	unlimited	
<b>Time of examination</b>		
<b>Credit points</b>	5 CP	
<b>Share on module final degree</b>	Course 1: %; Course 2: %.	
<b>Share of module grade on the course of study's final grade</b>	1	
<b>Reference text</b>	<p>The detailed program might vary in different years, as might do the teaching staff.</p> <p>Excursions might take place on weekends.</p> <p>Excursion length might be 1 or multiple days.</p> <p>The students may choose their excursions from several offers. Finally, they need to collect 5 credit points.</p> <p>Half a credit point (0.5 CP) can be earned for each day (including self-study before and after the excursion).</p>	
<b>Examination</b>	<b>Exam prerequisites</b>	<b>Type of examination</b>
<b>Course 1</b>		
<b>Course 2</b>		
<b>Final exam of module</b>		mündliche Prüfung

Examination		Exam prerequisites			Type of examination			
<b>Exam repetition information</b>								
Module course label	Course type	Course title	SWS	Workload of compulsory attendance	Workload of preparation / homework etc	Workload of independent learning	Workload (examination and preparation)	Sum workload
<b>Course 1</b>	Study trip	Exkursion	4					0
<b>Course 2</b>	Course	Selbststudium						0
<b>Workload by module</b>						150		150
<b>Total module workload</b>								150

## Project modules offered by the Institute of Biology (Nat Sci I)

### BIO.07675.03 - Project module 'Collections and Biodiversity Research' (MSc)

BIO.07675.03	5 CP
<b>Module label</b>	Project module 'Collections and Biodiversity Research' (MSc)
<b>Module code</b>	BIO.07675.03
<b>Semester of first implementation</b>	
<b>Module used in courses of study / semesters</b>	<ul style="list-style-type: none"> <li>Biodiversity Sciences (MA120 LP) (Master) &gt; Biologie BiodiversityMA120, Version of accreditation valid from SS 2021 &gt; Project modules offered by the Institute of Biology (Nat Sci I)</li> </ul>
<b>Responsible person for this module</b>	
<b>Further responsible persons</b>	PD Dr. Marcus Lehnert, PD Dr. Matthias Hoffmann, PD Dr. Hendrik Müller
<b>Prerequisites</b>	
<b>Skills to be acquired in this module</b>	<ul style="list-style-type: none"> <li>Acquire a basic understanding of organismic identification, taxonomy and nomenclature.</li> <li>Demonstrate the proper techniques for preserving biological specimens for multiple purposes through methods such as drying, pressing and storing in alcohol or formalin.</li> <li>Understand the importance of documenting collection parameters and using digital tools for permanent storage and retrieval of data.</li> <li>Evaluate and utilize online resources (i.e. collection databases; virtual herbaria, online sources for identification) to assess sampling biases and ensure representativeness in biodiversity studies.</li> <li>Ability to design field study plans that incorporate systematic, molecular, and ecological approaches, and select appropriate sampling strategies based on research goals.</li> <li>Critically analyse research articles with a focus on taxonomy and nomenclature.</li> <li>Knowledge of the main legal requirements for collecting biological specimens (e.g. CITES, CBD).</li> <li>Utilize collections in public knowledge transfer by communicating the importance of biodiversity research and showcasing the value of preserved specimens in scientific education.</li> <li>Utilize collections in public knowledge transfer by communicating the importance of biodiversity research and showcasing the value of preserved specimens in scientific education.</li> </ul>
<b>Module contents</b>	<ul style="list-style-type: none"> <li>Part I: Theoretical part covering the nature of a scientific natural collection; legal background (collection permits; CITES, CBD, Nagoya protocol); collection and preservation methods according to specific classes of organisms; organisation of a scientific collection; how to document, store and use collection data (e.g. GBIF, PlantList, etc.); usage of natural collections for student training and education. Possibilities to create sustainable outreach for the public, principles and limits of public relation work.</li> <li>Part II: Practical part including short field trips into the surroundings of Halle; collecting and documenting self-collected samples; preserving samples in a way fit for permanent storage in museum collections (e.g. pressing &amp; mounting of herbarium specimens); Determination of unknown species. Preparation of the framework for a public relations event.</li> <li>Part III: conducting small studies using real objects and/or digital collections; writing a final report on said project.</li> </ul>
<b>Forms of instruction</b>	Lecture (2 SWS) Exercises (2 SWS) Course Course
<b>Languages of instruction</b>	German, English
<b>Duration (semesters)</b>	2 Wochen in der Vorlesungsfreien Zeit Semester

BIO.07675.03

5 CP

<b>Module frequency</b>	jedes Wintersemester
<b>Module capacity</b>	unlimited
<b>Time of examination</b>	
<b>Credit points</b>	5 CP
<b>Share on module final degree</b>	Course 1: %; Course 2: %; Course 3: %; Course 4: %.
<b>Share of module grade on the course of study's final grade</b>	1

**Reference text**

Maximum number of students: 12; The three parts take place in Halle (Institute for Biology - Geobotany and Botanical Garden, MLU, Halle and/or Central Natural Sciences Collections - Zoological Collection, MLU, Halle).

The project modules require physical presence. In case of inability to attend (due to illness or other reasons) the lecturer must be notified promptly. To earn course credits, students must not exceed a 10% absence, equivalent to missing one day in a two weeks block module. In case of a longer absence there might be the possibility to compensate for missed days by additional tasks.

Examination	Exam prerequisites	Type of examination
<b>Course 1</b>		
<b>Course 2</b>		
<b>Course 3</b>		
<b>Course 4</b>		
<b>Final exam of module</b>		Protokoll oder Hausarbeit, Wissenschaftlicher Vortrag

<b>Exam repetition information</b>								
Module course label	Course type	Course title	SWS	Workload of compulsory attendance	Workload of preparation / homework etc	Workload of independent learning	Workload (examination and preparation)	Sum workload
<b>Course 1</b>	Lecture	Vorlesung	2					0
<b>Course 2</b>	Exercises	Übung	2					0
<b>Course 3</b>	Course	Selbststudium						0
<b>Course 4</b>	Course	Laborberichte						0
<b>Workload by module</b>						150		150
<b>Total module workload</b>								150

## BIO.07664.03 - Project module 'Field Ecology' (MSc)

BIO.07664.03

15 CP

<b>Module label</b>	Project module 'Field Ecology' (MSc)
<b>Module code</b>	BIO.07664.03
<b>Semester of first implementation</b>	
<b>Module used in courses of study / semesters</b>	<ul style="list-style-type: none"> <li>• Biodiversity Sciences (MA120 LP) (Master) &gt; Biologie BiodiversityMA120, Version of accreditation valid from SS 2021 &gt; Project modules offered by the Institute of Biology (Nat Sci I)</li> <li>• Biologie (MA120 LP) (Master) &gt; Biologie BiologieMA120, Version of accreditation valid from SoSe 2023 &gt; B1</li> <li>• Biologie (MA120 LP) (Master) &gt; Biologie BiologieMA120, Version of accreditation (WS 2010/11 - SoSe 2024) &gt; Wahlpflichtmodule</li> </ul>
<b>Responsible person for this module</b>	
<b>Further responsible persons</b>	Prof. Dr. I. Hensen, Prof. Dr. H. Bruelheide
<b>Prerequisites</b>	
<b>Skills to be acquired in this module</b>	<ul style="list-style-type: none"> <li>• Befähigung zur Identifizierung und Analyse grundlegender Probleme der Geobotanik und Pflanzenökologie, z. B. zum Verständnis des Aufbaus von Pflanzengemeinschaften und der Populationsdynamik.</li> <li>• Befähigung zur selbständigen Planung und Durchführung eines wissenschaftlichen Projekts im Bereich der Geobotanik und Pflanzenökologie, einschließlich der Formulierung einer Forschungsfrage, der Konzeption einer Studie sowie der Sammlung und Analyse von Daten.</li> <li>• Beherrschung der wichtigsten Methoden für die Feldarbeit in der Populations- und Freiland, wie z. B. Probenahmetechniken, Experimentelles Design, Datenerhebung und Datenanalyse.</li> <li>• Vertiefung der Kenntnisse über Arten und Pflanzengemeinschaften durch Feldstudien und praktische Erfahrungen, einschließlich des Verständnisses ihrer ökologischen Wechselwirkungen und Anpassungen.</li> <li>• Befähigung zur Auswertung und Interpretation feldökologischer Daten, einschließlich der statistischen Analyse und der Darstellung der Ergebnisse in schriftlicher und grafischer Form.</li> <li>• Befähigung, ökologische Publikationen kritisch zu analysieren und in die wissenschaftliche Debatte einzuordnen und dabei auch den grundlegenden Hintergrund zu verstehen.</li> <li>• Erlernen der Analyse und Interpretation von Zeitreihendaten zur biologischen Vielfalt, einschließlich des Verständnisses langfristiger ökologischer Trends und Muster und ihrer Auswirkungen auf Naturschutz und Management.</li> <li>• Befähigung zur effektiven Präsentation ökologischer Forschungsergebnisse, einschließlich mündlicher Präsentationen und schriftlicher Berichte.</li> </ul>

### Module contents

- Biologische Interaktionen
- Reproduktionsökologie
- Vegetations- und Landschaftsökologie
- Ökologie gefährdeter Arten
- Ökologie invasiver Arten
- Vegetationsmonitoring
- Geländearbeit im National Park Müritz (Biologische Station 'Faule Ort') oder in einem anderem Biodiversitäts-Hotspot
- Wiederholungsaufnahmen in Dauerflächen
- Traitanalysen

### Forms of instruction

Seminar (7 SWS)  
 Seminar (7 SWS)  
 Course  
 Course  
 Course  
 Seminar (1 SWS)  
 Course

BIO.07664.03

15 CP

<b>Languages of instruction</b>	German, English
<b>Duration (semesters)</b>	6 Wochen Semester
<b>Module frequency</b>	jedes Sommersemester
<b>Module capacity</b>	unlimited
<b>Time of examination</b>	
<b>Credit points</b>	15 CP
<b>Share on module final degree</b>	Course 1: %; Course 2: %; Course 3: %; Course 4: %; Course 5: %; Course 6: %; Course 7: %.
<b>Share of module grade on the course of study's final grade</b>	1

**Reference text**  
 The project modules require physical presence. In case of inability to attend (due to illness or other reasons) the lecturer must be notified promptly. To earn course credits, students must not exceed a 10% absence, equivalent to missing three days in a six-week block module. In case of a longer absence there might be the possibility to compensate for missed days by additional tasks.

Examination	Exam prerequisites	Type of examination
<b>Course 1</b>		
<b>Course 2</b>		
<b>Course 3</b>		
<b>Course 4</b>		
<b>Course 5</b>		
<b>Course 6</b>		
<b>Course 7</b>		

**Final exam of module** Referat

**Exam repetition information**

Module course label	Course type	Course title	SWS	Workload of compulsory attendance	Workload of preparation / homework etc	Workload of independent learning	Workload (examination and preparation)	Sum workload
<b>Course 1</b>	Seminar	Projektseminar `Populationsökologie gefährdeter Arten`		7				0
<b>Course 2</b>	Seminar	Projektseminar `Vegetationsökologie`		7				0
<b>Course 3</b>	Course	Selbststudium						0
<b>Course 4</b>	Course	Datenanalyse						0
<b>Course 5</b>	Course	Vorbereitung Literatur-Referat						0
<b>Course 6</b>	Seminar	Literaturseminar		1				0
<b>Course 7</b>	Course	Vorbereitung Abschluss-Referat						0
<b>Workload by module</b>						450		450
<b>Total module workload</b>								450



## BIO.07665.03 - Project module 'Nature Conservation' (MSc)

BIO.07665.03

15 CP

<b>Module label</b>	Project module 'Nature Conservation' (MSc)
<b>Module code</b>	BIO.07665.03
<b>Semester of first implementation</b>	
<b>Module used in courses of study / semesters</b>	<ul style="list-style-type: none"> <li>Biodiversity Sciences (MA120 LP) (Master) &gt; Biologie BiodiversityMA120, Version of accreditation valid from SS 2021 &gt; Project modules offered by the Institute of Biology (Nat Sci I)</li> <li>Biologie (MA120 LP) (Master) &gt; Biologie BiologieMA120, Version of accreditation valid from SoSe 2023 &gt; B1</li> <li>Biologie (MA120 LP) (Master) &gt; Biologie BiologieMA120, Version of accreditation (WS 2010/11 - SoSe 2024) &gt; Wahlpflichtmodule</li> </ul>
<b>Responsible person for this module</b>	
<b>Further responsible persons</b>	Prof. Dr. H. Pereira, Dr. E. Welk
<b>Prerequisites</b>	
<b>Skills to be acquired in this module</b>	<ul style="list-style-type: none"> <li>Understanding of the major scientific questions in the current conservation research and ability to critically analyse conservation biology publications</li> <li>Ability to understand the links between basic ecological research and its application in species, habitat, and landscape protection</li> <li>Knowledge of the main tools available for managing and protecting biodiversity, including the main legal frameworks and international agreements, and insights into the work of relevant authorities and, planning offices</li> <li>Basic knowledge of non-biological but important related disciplines for nature conservation biology (e. g. geography, nature conservation legislation, spatial planning)</li> <li>Ability to carry out independent scientific project with a field component and with relevance for nature conservation</li> <li>Proficiency in using field methods to record and assess populations and communities in the context of nature conservation</li> <li>Basic skills on ecological data analysis including GIS analysis</li> <li>Application of biogeographical principles, theories, and analyses to problems regarding biodiversity conservation</li> <li>In-depth understanding of species groups that are relevant to nature conservation practice</li> <li>Familiarity with nature conservation-relevant evaluation and assessment methods</li> </ul>

### Module contents

- Part I - Conserving biodiversity at the science-policy interface: ecosystems as social-ecological systems; perspectives and values on nature, international agreements
- Part II - Understanding biodiversity change: biodiversity state and trends including conservation biogeography; the contributions of nature to people; biodiversity and ecosystem function; monitoring biodiversity change; models and scenarios of biodiversity and ecosystem services
- Part III - Managing biodiversity: ecological restoration and rewilding; spatial planning, protected areas and protected species; legal tools; economic and behavioral tools
- Exchange with nature conservation practitioners
- Field project on a conservation-oriented topic

### Forms of instruction

Lecture (2 SWS)  
 Lecture (2 SWS)  
 Lecture (2 SWS)  
 Lecture (1 SWS)  
 Course  
 Course (2 SWS)  
 Course  
 Seminar (2 SWS)  
 Course  
 Practical training (4 SWS)

BIO.07665.03

15 CP

<b>Languages of instruction</b>	German, English
<b>Duration (semesters)</b>	6 Wochen Semester
<b>Module frequency</b>	jedes Sommersemester
<b>Module capacity</b>	unlimited
<b>Time of examination</b>	
<b>Credit points</b>	15 CP
<b>Share on module final degree</b>	Course 1: %; Course 2: %; Course 3: %; Course 4: %; Course 5: %; Course 6: %; Course 7: %; Course 8: %; Course 9: %; Course 10: %.
<b>Share of module grade on the course of study's final grade</b>	1

**Reference text**  
 The project modules require physical presence. In case of inability to attend (due to illness or other reasons) the lecturer must be notified promptly. To earn course credits, students must not exceed a 10% absence, equivalent to missing three days in a six-week block module. In case of a longer absence there might be the possibility to compensate for missed days by additional tasks.

Examination	Exam prerequisites	Type of examination
<b>Course 1</b>		
<b>Course 2</b>		
<b>Course 3</b>		
<b>Course 4</b>		
<b>Course 5</b>		
<b>Course 6</b>		
<b>Course 7</b>		
<b>Course 8</b>		
<b>Course 9</b>		
<b>Course 10</b>		
<b>Final exam of module</b>		mündl. Prüfung oder Klausur oder Referat

<b>Exam repetition information</b>								
Module course label	Course type	Course title	SWS	Workload of compulsory attendance	Workload of preparation / homework etc	Workload of independent learning	Workload (examination and preparation)	Sum workload
<b>Course 1</b>	Lecture	Vorlesung 'Conserving Biodiversity'		2				0
<b>Course 2</b>	Lecture	Vorlesung 'Biodiversity change'		2				0
<b>Course 3</b>	Lecture	Vorlesung 'Managing biodiversity'		2				0
<b>Course 4</b>	Lecture	Vorlesung 'Field methods and GIS'		1				0
<b>Course 5</b>	Course	Selbststudium						0
<b>Course 6</b>	Course	Datenanalyse		2				0
<b>Course 7</b>	Course	Vorbereitung Literaturreferat						0
<b>Course 8</b>	Seminar	Literaturseminar		2				0
<b>Course 9</b>	Course	Vorbereitung Abschlussreferat						0
<b>Course 10</b>	Practical training	Projekt im Feld		4				0
<b>Workload by module</b>						450		450
<b>Total module workload</b>								450

## BIO.07661.03 - Project module 'Methods of Systematic Botany' (MSc)

BIO.07661.03

15 CP

<b>Module label</b>	Project module 'Methods of Systematic Botany' (MSc)
<b>Module code</b>	BIO.07661.03
<b>Semester of first implementation</b>	
<b>Module used in courses of study / semesters</b>	<ul style="list-style-type: none"> <li>• Biodiversity Sciences (MA120 LP) (Master) &gt; Biologie BiodiversityMA120, Version of accreditation valid from SS 2021 &gt; Project modules offered by the Institute of Biology (Nat Sci I)</li> <li>• Biologie (MA120 LP) (Master) &gt; Biologie BiologieMA120, Version of accreditation valid from SoSe 2023 &gt; B1</li> <li>• Biologie (MA120 LP) (Master) &gt; Biologie BiologieMA120, Version of accreditation (WS 2010/11 - SoSe 2024) &gt; Wahlpflichtmodule</li> </ul>
<b>Responsible person for this module</b>	
<b>Further responsible persons</b>	Prof. Dr. M. Röser
<b>Prerequisites</b>	
<b>Skills to be acquired in this module</b>	<ul style="list-style-type: none"> <li>• Die Befähigung zur Entwicklung und Bearbeitung von wissenschaftlichen Fragestellungen in der Botanik</li> <li>• Beherrschung der Verwendung moderner Laborgeräte für die botanische Forschung</li> <li>• Beherrschung der Vorgehensweise taxonomischer Bestimmungen, experimenteller Techniken der Cytogenetik, sowie statistischer Auswertungsmethoden in Phylogenie und Biogeographie</li> <li>• Einblicke in Fragestellungen und Methoden der botanischen Phylogeographie und Populationsgenetik</li> <li>• Kompetenz in der Interpretation und kritischen Bewertung von Fachliteratur</li> <li>• Fähigkeit zur wissenschaftlichen Ausdrucksweise in Publikationen und Vorträgen</li> <li>• Vermittlung einer inhaltlichen und methodischen Themenübersicht im Bereich Botanik, sowie grundlegende Fähigkeiten wissenschaftlicher Forschung als Vorbereitung für die Masterarbeit</li> <li>• Darstellung eigener Versuchsergebnisse und Literaturreferat</li> </ul>
<b>Module contents</b>	<ul style="list-style-type: none"> <li>• Präparation, Mikroskopie, Bestimmungs- und Untersuchungsmethoden an Kryptogamen (Moosen, Flechten und Pilzen); Untersuchungen zur Morphologie, Ökomorphologie sowie Wuchsformen; Kartierungsmethoden</li> <li>• Beobachtungen und Experimente im Freiland zu morphologischen Anpassungen der Kryptogamen an Sonderstandorten; Kryptogamen als Bioindikatoren</li> <li>• Cytogenetische und molekular-cytogenetische Präparations-, Darstellungs- und Auswertungsverfahren; Bedeutung der Karyologie in der modernen Verwandtschaftsforschung</li> <li>• Artbildungsprozesse in Raum und Zeit (Phylogenie, Phylogeographie und populationsgenetische Analysen) - Vorstellung ausgewählter Analysesoftware, Methoden zur Untersuchung von Merkmalsevolution, geographischer Struktur von Gen-Poolen und Parentage-Analysen</li> <li>• Vergleiche räumlicher Verbreitungsmuster und Prozesse arktischer und temperater Pflanzenarten (Biogeographie)</li> <li>• Wissenschaftliche Recherche und Datenbanken</li> </ul>
<b>Forms of instruction</b>	Seminar (4 SWS) Seminar (3 SWS) Seminar (4 SWS) Seminar (3 SWS) Course Course Course Seminar (1 SWS)
<b>Languages of instruction</b>	German, English
<b>Duration (semesters)</b>	6 Wochen Semester

BIO.07661.03

15 CP

<b>Module frequency</b>	jedes Wintersemester
<b>Module capacity</b>	unlimited
<b>Time of examination</b>	
<b>Credit points</b>	15 CP
<b>Share on module final degree</b>	Course 1: %; Course 2: %; Course 3: %; Course 4: %; Course 5: %; Course 6: %; Course 7: %; Course 8: %.
<b>Share of module grade on the course of study's final grade</b>	1
<b>Reference text</b>	The project modules require physical presence. In case of inability to attend (due to illness or other reasons) the lecturer must be notified promptly. To earn course credits, students must not exceed a 10% absence, equivalent to missing three days in a six-week block module. In case of a longer absence there might be the possibility to compensate for missed days by additional tasks.

Examination	Exam prerequisites	Type of examination
<b>Course 1</b>		
<b>Course 2</b>		
<b>Course 3</b>		
<b>Course 4</b>		
<b>Course 5</b>		
<b>Course 6</b>		
<b>Course 7</b>		
<b>Course 8</b>		

**Final exam of module** Hausarbeit, Referat

**Exam repetition information**

Module course label	Course type	Course title	SWS	Workload of compulsory attendance	Workload of preparation / homework etc	Workload of independent learning	Workload (examination and preparation)	Sum workload
<b>Course 1</b>	Seminar	Projektseminar `Moose, Flechten, Pilze`		4				0
<b>Course 2</b>	Seminar	Projektseminar `Ökomorphologie und Wuchformen`		3				0
<b>Course 3</b>	Seminar	Projektseminar `Klassische und molekulare Cytogenetik`		4				0
<b>Course 4</b>	Seminar	Projektseminar `Biogeographie`, Phylogenie, Phylogeographie und Populationsgenetik		3				0
<b>Course 5</b>	Course	Selbststudium						0
<b>Course 6</b>	Course	Wissenschaftliche Kurzvorträge						0
<b>Course 7</b>	Course	Schriftliche Ausarbeitung						0
<b>Course 8</b>	Seminar	Seminar Wissenschaftliche Recherche		1				0

**Workload by module** 450 450

**Total module workload** 450

## BIO.07666.03 - Project module 'Spatial Ecology and Modeling' (MSc)

BIO.07666.03

15 CP

<b>Module label</b>	Project module 'Spatial Ecology and Modeling' (MSc)
<b>Module code</b>	BIO.07666.03
<b>Semester of first implementation</b>	
<b>Module used in courses of study / semesters</b>	<ul style="list-style-type: none"> <li>Biodiversity Sciences (MA120 LP) (Master) &gt; Biologie BiodiversityMA120, Version of accreditation valid from SS 2021 &gt; Project modules offered by the Institute of Biology (Nat Sci I)</li> <li>Biologie (MA120 LP) (Master) &gt; Biologie BiologieMA120, Version of accreditation valid from SoSe 2023 &gt; B1</li> <li>Biologie (MA120 LP) (Master) &gt; Biologie BiologieMA120, Version of accreditation (WS 2010/11 - SoSe 2024) &gt; Wahlpflichtmodule</li> </ul>
<b>Responsible person for this module</b>	
<b>Further responsible persons</b>	Prof. Dr. H. M. Pereira, Prof. Dr. T. M. Knight, Prof. Dr. S. Harpole, Prof. Dr. I. Kühn
<b>Prerequisites</b>	
<b>Skills to be acquired in this module</b>	<ul style="list-style-type: none"> <li>Develop a basic understanding of the different types of models used in ecology, including differential, individual based models and grid simulations, statistical models, and particularly species distribution models. Apply this knowledge to ecological questions and determine the appropriate type of model needed for a given scenario.</li> <li>Develop the ability to create and parameterize models in order to simulate ecological systems. Understand the importance of evaluating uncertainty in model results and apply appropriate techniques to assess and communicate this uncertainty.</li> <li>Gain proficiency in comparing model results with empirical data, to interpret model results, interpreting model outputs, and assessing the quality and relevance of the models. Develop critical thinking skills to identify limitations and assumptions in ecological models and evaluate their implications.</li> <li>Acquire a basic command of the R programming language, including the ability to write simple programs for data manipulation, analysis, and visualization. Understand how to apply R for ecological modeling and simulation.</li> <li>Develop the ability to read and analyse research articles with a strong theoretical or modeling component. Use this skill to critically evaluate the approaches, methods and results presented in the literature and identify gaps or areas for further research.</li> </ul>

### Module contents

- Part I: Theoretical Ecology and Modeling: Introduction to programming in R: scripts and the command line, variables, data structures (vectors and matrices); numerical operations; matrix operations; plots; logical expressions and conditional operations, functions. - Basic statistical operations with R: descriptive statistics and histograms, regression, and hypothesis testing. - Ecophysiology: a model of thermoregulation and the concept of climate space; modeling the impacts of climate change using ecophysiological models. - Behavioral ecology: introduction to economic analysis of behavior; models for optimal foraging; game theory and evolutionary stable strategies; Modelling animal movement and plant dispersal as a random-walk. Monitoring theory: bayesian modelling of site occupancy, species-area relationships and species-abundance distributions. - Social-ecological models: coupling social models of decision-making with ecological models; introduction to regime shifts and scenario modelling.
- Part II: Population Ecology: Introduction to modeling the dynamics of populations using mathematical models (difference equations and individual based models). - Focus on developing and interpreting models, including generating questions, deciding on the appropriate modelling approach, creating the model, parameterizing the model, creating population projections using the model, conducting sensitivity analyses of model parameters, and interpreting and presenting the results. -Models will focus on conservation application. -Models will increase in complexity, from simple exponential growth models, to incorporating various complexities that are common in ecological systems, such as environmental stochasticity, density dependence, and

- stage, age or size structure.
- Part III: Community Ecology (Theory, reading and modeling in R): Competition and coexistence (phenomenological). - Competition and coexistence (mechanistic). - Other coexistence mechanisms (predation). - Coexistence in space. - Niche, neutral and stochasticity.
  - Part IV: Analyzing Spatial data with R: Specifics of spatial data in statistical analyses; data preparation and transformations; assumptions of and conditions for spatial analyses of ecological data. - Visualizing spatial data in R. - Reviving Generalized Linear Models; calibration, validation, prediction and projection; accounting for spatial autocorrelation. - Introduction to Species Distribution Models; overview on different algorithms (e.g. Generalized Additive Models, Boosted Regression Trees) and available R packages.

<b>Forms of instruction</b>	Lecture (2 SWS) Lecture (1 SWS) Lecture (1 SWS) Lecture (1 SWS) Exercises (10 SWS) Course Course
<b>Languages of instruction</b>	German, English
<b>Duration (semesters)</b>	6 Wochen Semester
<b>Module frequency</b>	jedes Wintersemester
<b>Module capacity</b>	unlimited
<b>Time of examination</b>	
<b>Credit points</b>	15 CP
<b>Share on module final degree</b>	Course 1: %; Course 2: %; Course 3: %; Course 4: %; Course 5: %; Course 6: %; Course 7: %.
<b>Share of module grade on the course of study's final grade</b>	1
<b>Reference text</b>	<p>Maximum number of students (with focus ecology): 16; The four parts take place in Halle (Institute for Biology - Geobotany and Botanical Garden, MLU, Halle and/or Helmholtz Centre for Environmental Research, UFZ, Halle) and in Leipzig (German Center for Integrative Biodiversity Research - iDiv), respectively.</p> <p>The project modules require physical presence. In case of inability to attend (due to illness or other reasons) the lecturer must be notified promptly. To earn course credits, students must not exceed a 10% absence, equivalent to missing three days in a six-week block module. In case of a longer absence there might be the possibility to compensate for missed days by additional tasks.</p>

Examination	Exam prerequisites	Type of examination						
<b>Course 1</b>								
<b>Course 2</b>								
<b>Course 3</b>								
<b>Course 4</b>								
<b>Course 5</b>								
<b>Course 6</b>								
<b>Course 7</b>								
<b>Final exam of module</b>		Hausarbeit, Klausur						
<b>Exam repetition information</b>								
Module course label	Course type	Course title	SWS	Workload of compulsory attendance	Workload of preparation / homework etc	Workload of independent learning	Workload (examination and preparation)	Sum workload
<b>Course 1</b>	Lecture	Lecture 'Theoretical Ecology and Modeling'		2				0
<b>Course 2</b>	Lecture	Lecture 'Introduction to Population		1				0

Module course label	Course type	Course title	SWS	Workload of compulsory attendance	Workload of preparation / homework etc	Workload of independent learning	Workload (examination and preparation)	Sum workload
		Ecology'						
<b>Course 3</b>	Lecture	Lecture 'Community Ecology'		1				0
<b>Course 4</b>	Lecture	Lecture 'Analyzing spatial data with R'		1				0
<b>Course 5</b>	Exercises	Practical course 'Spatial Ecology /Ecological Modeling'		10				0
<b>Course 6</b>	Course	Lab assignment reports						0
<b>Course 7</b>	Course	Pre- and post-lecture self-study and literature work						0
<b>Workload by module</b>						450		450
<b>Total module workload</b>								450

## BIO.07663.03 - Project module 'Evolutionary Animal Ecology' (MSc)

BIO.07663.03 15 CP

**Module label** Project module 'Evolutionary Animal Ecology' (MSc)

**Module code** BIO.07663.03

**Semester of first implementation**

**Module used in courses of study / semesters**

- Biodiversity Sciences (MA120 LP) (Master) > Biologie BiodiversityMA120, Version of accreditation valid from SS 2021 > Project modules offered by the Institute of Biology (Nat Sci I)
- Biologie (MA120 LP) (Master) > Biologie BiologieMA120, Version of accreditation valid from SoSe 2023 > B1
- Biologie (MA120 LP) (Master) > Biologie BiologieMA120, Version of accreditation (WS 2010/11 - SoSe 2024) > Wahlpflichtmodule

**Responsible person for this module**

**Further responsible persons** Prof.in Dr. C. Fricke

**Prerequisites**

**Skills to be acquired in this module**

- Entwicklung der Fähigkeit, klare und überprüfbare wissenschaftliche Fragen im Zusammenhang mit tierökologischen Fragestellungen zu formulieren, die sich auf ein Verständnis der evolutionären Prinzipien und ökologischen Prozesse stützen.
- Erwerb fundierter Kenntnisse über eine Bandbreite von zoologischen und tierökologischen Forschungsmethoden.
- Erwerb praktischer Fähigkeiten in der Anwendung spezifischer tierökologischer Forschungsmethoden.
- Erarbeitung eines umfassenden Verständnisses evolutionärer Theorien und ihrer Anwendung auf die Untersuchung des Verhaltens von Tieren.
- Entwicklung der Fähigkeit, wissenschaftliche Literatur im Bereich der Tierökologie kritisch zu bewerten und die Stärken und Grenzen verschiedener Forschungsmethoden und -Ergebnisse einzuschätzen.
- Verbesserung der Fähigkeiten zur effektiven Präsentation von Forschungsergebnissen, sowohl mündlich als auch in schriftlicher Form, mit Schwerpunkt auf Klarheit, Kohärenz und überzeugender Argumentation (bevorzugt auf Englisch).

**Module contents**

- Evolutionäre und tierökologische Theorien
- Fortpflanzungsökologie
- Entomologie
- Molekulare Evolution

**Forms of instruction** Lecture (3 SWS)  
Course  
Seminar (2 SWS)  
Exercises  
Practical training (6 SWS)  
Exercises (2 SWS)  
Seminar (2 SWS)

**Languages of instruction** German, English

**Duration (semesters)** 6 Wochen Semester

**Module frequency** jedes Sommersemester

**Module capacity** unlimited

**Time of examination**

**Credit points** 15 CP

**Share on module final degree** Course 1: %; Course 2: %; Course 3: %; Course 4: %; Course 5: %; Course 6: %; Course 7: %.

**Share of module grade on the course of study's final grade** 1

**Reference text** max. 8 Studierende

The project modules require physical presence. In case of inability to attend



(due to illness or other reasons) the lecturer must be notified promptly. To earn course credits, students must not exceed a 10% absence, equivalent to missing three days in a six-week block module. In case of a longer absence there might be the possibility to compensate for missed days by additional tasks.

Examination		Exam prerequisites			Type of examination			
<b>Course 1</b>								
<b>Course 2</b>								
<b>Course 3</b>								
<b>Course 4</b>								
<b>Course 5</b>								
<b>Course 6</b>								
<b>Course 7</b>								
<b>Final exam of module</b>		Protokoll, wissenschaftlicher Vortrag			mündliche Prüfung, Hausarbeit			
<b>Exam repetition information</b>								
Module course label	Course type	Course title	SWS	Workload of compulsory attendance	Workload of preparation / homework etc	Workload of independent learning	Workload (examination and preparation)	Sum workload
<b>Course 1</b>	Lecture	Vorlesung: Diverse Themen in der Tierökologie		3				0
<b>Course 2</b>	Course	Selbststudium: Spezialthemen in der Tierökologie						0
<b>Course 3</b>	Seminar	Seminar: Fortgeschrittene Themen in der Tierökologie		2				0
<b>Course 4</b>	Exercises	Übung: Spezialthemen in der Tierökologie						0
<b>Course 5</b>	Practical training	Praktikum: Forschungsprojekt in der Tierökologie		6				0
<b>Course 6</b>	Exercises	Übung: Forschungsprojekt in der Tierökologie		2				0
<b>Course 7</b>	Seminar	Seminar: Forschungsprojekt in der Tierökologie		2				0
<b>Workload by module</b>						450		450
<b>Total module workload</b>								450

## BIO.07662.03 - Project module 'General Zoology' (MSc)

BIO.07662.03 15 CP

**Module label** Project module 'General Zoology' (MSc)

**Module code** BIO.07662.03

**Semester of first implementation**

**Module used in courses of study / semesters**

- Biodiversity Sciences (MA120 LP) (Master) > Biologie BiodiversityMA120, Version of accreditation valid from SS 2021 > Project modules offered by the Institute of Biology (Nat Sci I)
- Biologie (MA120 LP) (Master) > Biologie BiologieMA120, Version of accreditation valid from SoSe 2023 > B1
- Biologie (MA120 LP) (Master) > Biologie BiologieMA120, Version of accreditation (WS 2010/11 - SoSe 2024) > Wahlpflichtmodule

**Responsible person for this module**

**Further responsible persons** Prof. Dr. R. Paxton

**Prerequisites**

**Skills to be acquired in this module**

- Entwicklung von Schlüsselkompetenzen bei der Problemlösung, Planung und Durchführung von Experimenten mit Insekten sowie bei der Datenanalyse
- Beherrschung forschungsorientierter experimenteller Techniken in der Tierökologie und Verhaltensbiologie
- Verstehen der theoretischen Grundlagen und praktischen Anwendungen molekularer und genetischer Techniken in der Zoologie
- Fähigkeit zur Anwendung und Interpretation der Ergebnisse von Methoden zur Erforschung und zum Monitoring der biologischen Vielfalt von Tieren
- Verständnis des Konzepts des "evolutionären Übergangs/evolutionary transition", seiner Anwendung auf soziale Insekten und auf allen Ebenen der biologischen Organisation
- Erwerb von fachspezifischen Schlüsselkompetenzen in der Präsentation von Forschungsergebnissen in Wort und Schrift
- Entwicklung der Kompetenz zur kritischen Bewertung der eigenen wissenschaftlichen Arbeit und der Ergebnisse anderer Forschungsgruppen
- Entwicklung der eigenen Forschungskompetenz als Grundlage für eine Masterarbeit
- Entwicklung fachdidaktischer Fähigkeiten und Fertigkeiten durch Vorlesungen und praktische Übungen

**Module contents**

- Ökologie der Wirt-Mikroben-Interaktion und Koevolution von Wirt und Parasit, mit Schwerpunkt auf sozialen Insekten
- Anwendung molekulargenetischer Methoden in den Biodiversitätswissenschaften (Ökologie und Evolution)
- Wechselwirkungen zwischen Pflanzen und Insekten, Bestäubung und die räumliche Ökologie von Bestäubern
- Grundkenntnisse der Methoden zur Erforschung und zum Monitoring der biologischen Vielfalt im Feld und im Labor
- Soziale Evolution als wichtiger evolutionärer Übergang

**Forms of instruction** Course  
Seminar (13 SWS)  
Seminar (2 SWS)  
Course  
Course  
Course

**Languages of instruction** German, English

**Duration (semesters)** 6 Wochen Semester

**Module frequency** jedes Sommersemester

**Module capacity** unlimited

**Time of examination**

BIO.07662.03

15 CP

<b>Credit points</b>	15 CP
<b>Share on module final degree</b>	Course 1: %; Course 2: %; Course 3: %; Course 4: %; Course 5: %; Course 6: %.
<b>Share of module grade on the course of study's final grade</b>	1
<b>Reference text</b>	The project modules require physical presence. In case of inability to attend (due to illness or other reasons) the lecturer must be notified promptly. To earn course credits, students must not exceed a 10% absence, equivalent to missing three days in a six-week block module. In case of a longer absence there might be the possibility to compensate for missed days by additional tasks.

Examination	Exam prerequisites	Type of examination
<b>Course 1</b>		
<b>Course 2</b>		
<b>Course 3</b>		
<b>Course 4</b>		
<b>Course 5</b>		
<b>Course 6</b>		
<b>Final exam of module</b>		Praktikumsbericht, Referat

<b>Exam repetition information</b>								
Module course label	Course type	Course title	SWS	Workload of compulsory attendance	Workload of preparation / homework etc	Workload of independent learning	Workload (examination and preparation)	Sum workload
<b>Course 1</b>	Course	Selbststudium						0
<b>Course 2</b>	Seminar	Projektseminar Allgemeine Zoologie	13					0
<b>Course 3</b>	Seminar	Seminar, Ergebnispräsentation in englischer Sprache	2					0
<b>Course 4</b>	Course	Lesen und Auswerten wissenschaftlicher Literatur						0
<b>Course 5</b>	Course	Schreiben eines wissenschaftlichen Berichts						0
<b>Course 6</b>	Course	Datenanalyse						0
<b>Workload by module</b>						450		450
<b>Total module workload</b>								450

## Project modules offered by the Institute of Geosciences and Geography (Nat Sci III)

### GEO.07212.02 - Land System Science 1: Global Environmental Change

GEO.07212.02

5 CP

<b>Module label</b>	Land System Science 1: Global Environmental Change
<b>Module code</b>	GEO.07212.02
<b>Semester of first implementation</b>	
<b>Module used in courses of study / semesters</b>	<ul style="list-style-type: none"> <li>• Angewandte Geowissenschaften (Applied Geosciences) (MA120 LP) (Master) &gt; Geowissenschaften Angew. Geowissensch.MA120, Version of accreditation valid from WS 2021/22 &gt; Wahlpflichtmodule Nebenfächer</li> <li>• Biodiversity Sciences (MA120 LP) (Master) &gt; Biologie BiodiversityMA120, Version of accreditation valid from SS 2021 &gt; Project modules offered by the Institute of Geosciences and Geography (Nat Sci III)</li> <li>• International Area Studies - Global Change Geography (MA120 LP) (Master) &gt; Geographie/Erdkunde IntArStudGlobChaGeoMA120, Version of accreditation valid from SS 2021 &gt; Schwerpunkt- oder Ergänzungsbereich: Land Systems Science (LSS)</li> <li>• Management natürlicher Ressourcen (MA120 LP) (Master) &gt; Landespflege/Landschaftsgestaltung Management nat.RessoMA120, Version of accreditation valid from WS 2021/22 &gt; Wahlpflichtbereich</li> </ul>

**Responsible person for this module**

**Further responsible persons**

Prof. Dr. Christopher Conrad

**Prerequisites**

**Skills to be acquired in this module**

- Theoretische Konzepte zur Erfassung, Analyse und Bewertung des Globalen Wandels und der Nachhaltigkeit benennen, abrufen, beschreiben, unterscheiden, interpretieren und erklären
- Landsysteme als Ergebnis globalen Wandels erkennen, interpretieren und differenzieren
- Lösungsansätze, sowie die Möglichkeiten und Herausforderungen bei der Erarbeitung selbiger kennenlernen, gegenüberstellen und vor dem Hintergrund ihrer Nachhaltigkeit kritisch bewerten
- Wissen über den Zustand und Entwicklungen (Trends) von Landsystemen anhand von Fallstudien sammeln, anwenden, bewerten und damit argumentieren
- Digitale Daten und Werkzeuge, Landsysteme zu erfassen, eigenständig nutzen, und damit Treiber und Auswirkungen von Veränderung der Landsysteme erkennen und bewerten

**Module contents**

- Theoretische Konzepte: Globaler Wandel, Umweltsynndrome, Landsysteme, Landnutzung und Ökosystemleistungen, Nexus-Forschung, Nachhaltigkeit
- Methodische Ansätze, die globalen Wandel erfassen, analysieren und bewerten lassen und zu Handlungsempfehlungen führen: Ökologische Footprintanalysen, Statistische Analysen von raumzeitlichen Zusammenhängen, Mixed Methods Ansätze
- Datenkonzepte und existierende Daten auf unterschiedlichen Maßstabsebenen, die den Zustand und die Veränderungen von Landsystemen beschreiben lassen
- Erfassung des Status, von Veränderungen und Trends von Landsystemen mit Methoden der Fernerkundung

**Forms of instruction**

Lecture (2 SWS)  
Exercises (2 SWS)  
Course  
Course  
Course

GEO.07212.02

5 CP

<b>Languages of instruction</b>		German, English						
<b>Duration (semesters)</b>		1 Semester Semester						
<b>Module frequency</b>		jedes Wintersemester						
<b>Module capacity</b>		unlimited						
<b>Time of examination</b>								
<b>Credit points</b>		5 CP						
<b>Share on module final degree</b>		Course 1: %; Course 2: %; Course 3: %; Course 4: %; Course 5: %.						
<b>Share of module grade on the course of study's final grade</b>		1						
Examination		Exam prerequisites			Type of examination			
<b>Course 1</b>								
<b>Course 2</b>								
<b>Course 3</b>								
<b>Course 4</b>								
<b>Course 5</b>								
<b>Final exam of module</b>		Übungsaufgabe(n)			Klausur oder Hausarbeit oder mündliche Prüfung			
<b>Exam repetition information</b>								
Module course label	Course type	Course title	SWS	Workload of compulsory attendance	Workload of preparation / homework etc	Workload of independent learning	Workload (examination and preparation)	Sum workload
<b>Course 1</b>	Lecture	Vorlesung	2					0
<b>Course 2</b>	Exercises	Übung	2					0
<b>Course 3</b>	Course	Vor- und Nachbereitung Vorlesung						0
<b>Course 4</b>	Course	Vor- und Nachbereitung Übung						0
<b>Course 5</b>	Course	Vorbereitung der Modulleistung						0
<b>Workload by module</b>						150		150
<b>Total module workload</b>								150

## GEO.07225.02 - Social-Ecological Systems 3: Academic Writing I

GEO.07225.02		5 CP
<b>Module label</b>	Social-Ecological Systems 3: Academic Writing I	
<b>Module code</b>	GEO.07225.02	
<b>Semester of first implementation</b>		
<b>Module used in courses of study / semesters</b>	<ul style="list-style-type: none"> <li>Biodiversity Sciences (MA120 LP) (Master) &gt; Biologie BiodiversityMA120, Version of accreditation valid from SS 2021 &gt; Project modules offered by the Institute of Geosciences and Geography (Nat Sci III)</li> <li>International Area Studies - Global Change Geography (MA120 LP) (Master) &gt; Geographie/Erkunde IntArStudGlobChaGeoMA120, Version of accreditation valid from SS 2021 &gt; Schwerpunkt- oder Ergänzungsbereich: Social-Ecological Systems (SES)</li> </ul>	
<b>Responsible person for this module</b>		
<b>Further responsible persons</b>	Prof. Dr. Christine Fürst	
<b>Prerequisites</b>		
<b>Skills to be acquired in this module</b>	<ul style="list-style-type: none"> <li>Kenntnis und Verständnis der notwendigen Bestandteile und der Struktur wissenschaftlicher Texte, einschließlich der Abschnitte Einleitung, Methoden, Ergebnisse und Diskussion</li> <li>Fähigkeit, wissenschaftliche Literatur zum gewählten Forschungsthema kritisch zu analysieren und zu bewerten und sie in die Einleitung und den Diskussionsteil des wissenschaftlichen Textes zu integrieren</li> <li>Entwicklung der Fähigkeit, klare, prägnante und zusammenhängende wissenschaftliche Texte unter Verwendung einer angemessenen wissenschaftlichen Sprache und Terminologie in englischer Sprache zu verfassen (AE)</li> </ul> <p>Entwicklung der Fähigkeit, selbstständig Fachtexte zu erstellen und den Schreibstil und die Sprache auf das Zielpublikum abzustimmen Entwicklung von Verständnis für ethische Grundsätze und Richtlinien für wissenschaftliches Schreiben, einschließlich der Vermeidung von Plagiaten und der Gewährleistung der Integrität der wissenschaftlichen Forschung</p>	
<b>Module contents</b>	<ul style="list-style-type: none"> <li>Gliederung und Evaluierungskriterien für wissenschaftliche Texte</li> <li>Sprachstil wissenschaftlicher Texte</li> <li>Grammatik, Schreibregeln</li> </ul>	
<b>Forms of instruction</b>	Lecture (1 SWS) Exercises (3 SWS) Course Course Course Course	
<b>Languages of instruction</b>	German, English	
<b>Duration (semesters)</b>	1 Semester Semester	
<b>Module frequency</b>	jedes Sommersemester	
<b>Module capacity</b>	unlimited	
<b>Time of examination</b>		
<b>Credit points</b>	5 CP	
<b>Share on module final degree</b>	Course 1: %; Course 2: %; Course 3: %; Course 4: %; Course 5: %; Course 6: %.	
<b>Share of module grade on the course of study's final grade</b>	1	
Examination	Exam prerequisites	Type of examination
<b>Course 1</b>		
<b>Course 2</b>		
<b>Course 3</b>		
<b>Course 4</b>		

Examination		Exam prerequisites			Type of examination			
<b>Course 5</b>								
<b>Course 6</b>								
<b>Final exam of module</b>		Erfüllung der Arbeitsaufträge			Hausarbeit			
<b>Exam repetition information</b>								
Module course label	Course type	Course title	SWS	Workload of compulsory attendance	Workload of preparation / homework etc	Workload of independent learning	Workload (examination and preparation)	Sum workload
<b>Course 1</b>	Lecture	Vorlesung		1				0
<b>Course 2</b>	Exercises	Übung		3				0
<b>Course 3</b>	Course	Vor- und Nachbereitung Vorlesung						0
<b>Course 4</b>	Course	Vor- und Nachbereitung Übung						0
<b>Course 5</b>	Course	Erfüllung Arbeitsaufträge						0
<b>Course 6</b>	Course	Vorbereitung Modulleistung						0
<b>Workload by module</b>						150		150
<b>Total module workload</b>								150

## GEO.07712.02 - Environmental Modelling and Simulation

GEO.07712.02		5 CP
<b>Module label</b>	Environmental Modelling and Simulation	
<b>Module code</b>	GEO.07712.02	
<b>Semester of first implementation</b>		
<b>Module used in courses of study / semesters</b>	<ul style="list-style-type: none"> <li>• Biodiversity Sciences (MA120 LP) (Master) &gt; Biologie BiodiversityMA120, Version of accreditation valid from SS 2021 &gt; Project modules offered by the Institute of Geosciences and Geography (Nat Sci III)</li> <li>• International Area Studies - Global Change Geography (MA120 LP) (Master) &gt; Geographie/Erdkunde IntArStudGlobChaGeoMA120, Version of accreditation valid from SS 2021 &gt; Schwerpunkt- oder Ergänzungsbereich: Land Systems Science (LSS)</li> <li>• Management natürlicher Ressourcen (MA120 LP) (Master) &gt; Landespflege/Landschaftsgestaltung Management nat.RessoMA120, Version of accreditation valid from WS 2021/22 &gt; Wahlpflichtbereich</li> </ul>	
<b>Responsible person for this module</b>		
<b>Further responsible persons</b>	Prof. Dr. Ralf Seppelt	
<b>Prerequisites</b>		
<b>Skills to be acquired in this module</b>	<ul style="list-style-type: none"> <li>• Erwerb theoretischer, konzeptioneller und praktischer Kenntnisse zur Umsetzung des Verständnisses landschaftsökologischer Prozesse in konzeptionelle, mathematische Modelle und Computermodelle</li> <li>• Erlangung von Kenntnissen in der Anwendung von Software und Programmierwerkzeugen, die üblicherweise in der Umweltmodellierung und -simulation eingesetzt werden.</li> <li>• Kritische Bewertung der Stärken und Grenzen verschiedener Modellierungsansätze im Kontext der Biodiversitätswissenschaften und des Umweltmanagements</li> <li>• Erwerb von Kompetenzen und Erfahrungen zur Beurteilung der Qualität von Modellergebnissen und Anwendung dieser Kenntnisse auf aktuelle Bewertungsstudien aus der Literatur</li> </ul>	
<b>Module contents</b>	<ul style="list-style-type: none"> <li>• Aufarbeitung ökologischen Prozessverständnisses zur Quantifizierung relevanter Umweltprozesse und hydrologischer Prozesse auf Landschafts-Skala und Einzugsgebiets-Skala, Wasser- und Stoffdynamik, Spezies-Verteilung, Wechselwirkungen biotischer und abiotischer Prozesse und Nutzung menschlicher Ressourcen</li> <li>• Datenanalyse und Modellentwicklung auf der Basis von Standard-OpenSource Werkzeugen (derzeit R/RStudio; veränderlich, wenn schnellere und leicht zu benutzende Tools zur Verfügung stehen)</li> <li>• Kritische Bewertung des Ablaufs der Modellbildung, der Bewertung von Modellergebnissen und der Publikation von Modellstudien</li> </ul>	
<b>Forms of instruction</b>	Lecture (2 SWS) Exercises (2 SWS) Course Course	
<b>Languages of instruction</b>	German, English	
<b>Duration (semesters)</b>	1 Semester Semester	
<b>Module frequency</b>	jedes Sommersemester	
<b>Module capacity</b>	unlimited	
<b>Time of examination</b>		
<b>Credit points</b>	5 CP	
<b>Share on module final degree</b>	Course 1: %; Course 2: %; Course 3: %; Course 4: %.	
<b>Share of module grade on the course of study's final grade</b>	1	
Examination	Exam prerequisites	Type of examination
<b>Course 1</b>		



Examination		Exam prerequisites			Type of examination			
<b>Course 2</b>								
<b>Course 3</b>								
<b>Course 4</b>								
<b>Final exam of module</b>		mindestens 50% der Hausaufgaben einreichen			Klausur			
<b>Exam repetition information</b>								
Module course label	Course type	Course title	SWS	Workload of compulsory attendance	Workload of preparation / homework etc	Workload of independent learning	Workload (examination and preparation)	Sum workload
<b>Course 1</b>	Lecture	Vorlesung		2				0
<b>Course 2</b>	Exercises	Übung		2				0
<b>Course 3</b>	Course	Vor- und Nachbereitung						0
<b>Course 4</b>	Course	Klausurvorbereitung						0
<b>Workload by module</b>						150		150
<b>Total module workload</b>								150

## GEO.07224.03 - Social-Ecological Systems 2: Spatial Modelling, Scenario Development and Impact Assessment II

GEO.07224.03

5 CP

<b>Module label</b>	Social-Ecological Systems 2: Spatial Modelling, Scenario Development and Impact Assessment II	
<b>Module code</b>	GEO.07224.03	
<b>Semester of first implementation</b>		
<b>Module used in courses of study / semesters</b>	<ul style="list-style-type: none"> <li>Biodiversity Sciences (MA120 LP) (Master) &gt; Biologie BiodiversityMA120, Version of accreditation valid from SS 2021 &gt; Project modules offered by the Institute of Geosciences and Geography (Nat Sci III)</li> <li>International Area Studies - Global Change Geography (MA120 LP) (Master) &gt; Geographie/Erdkunde IntArStudGlobChaGeoMA120, Version of accreditation valid from SS 2021 &gt; Schwerpunkt- oder Ergänzungsbereich: Social-Ecological Systems (SES)</li> </ul>	
<b>Responsible person for this module</b>		
<b>Further responsible persons</b>	Prof. Dr. Christine Fürst	
<b>Prerequisites</b>		
<b>Skills to be acquired in this module</b>	<ul style="list-style-type: none"> <li>Aneignung fortgeschrittener Kenntnisse der Systemmodellierung im Kontext sozial-ökologischer Systeme</li> <li>Erwerb von Kenntnissen über getestete Systemmodelle und Verständnis für die Stärken und Grenzen verschiedener Systemmodelle</li> <li>Entwicklung der Fähigkeit, geeignete getestete Systemmodelle für spezifische Forschungsfragen und Szenarien in sozial-ökologischen Systemen auszuwählen und anzuwenden</li> <li>Erlangung von umfassenden Kenntnissen über verschiedene Arten von Modellen sowie Methoden der qualitativen Wissensgenerierung und Anwendung der Kenntnisse in verschiedenen Themenbereichen durch die Analyse und Entwicklung von Fallstudien im Zusammenhang mit der Erhaltung der biologischen Vielfalt, dem Management von Ökosystemen oder der nachhaltigen Entwicklung in sozial-ökologischen Systemen</li> </ul>	
<b>Module contents</b>	<ul style="list-style-type: none"> <li>Integration sektoraler Modelle (Land-, Forstwirtschaft, Ökologie) in Großraummodelle</li> <li>Erfassung und Modellierung sozialer Netzwerke</li> <li>Verfahren der Wissensübertragung und Einbindung unterschiedlicher Akteurstypen in multikriterielle Bewertungsgrundlagen</li> <li>Fallbeispiele aus unterschiedlichen Politikfeldern der Raumgestaltung und Ressourcennutzung</li> </ul>	
<b>Forms of instruction</b>	Lecture (1 SWS) Exercises (3 SWS) Course Course Course Course	
<b>Languages of instruction</b>	German, English	
<b>Duration (semesters)</b>	1 Semester Semester	
<b>Module frequency</b>	jedes Sommersemester	
<b>Module capacity</b>	unlimited	
<b>Time of examination</b>		
<b>Credit points</b>	5 CP	
<b>Share on module final degree</b>	Course 1: %; Course 2: %; Course 3: %; Course 4: %; Course 5: %; Course 6: %.	
<b>Share of module grade on the course of study's final grade</b>	1	
<b>Examination</b>	Exam prerequisites	Type of examination

Examination		Exam prerequisites			Type of examination			
<b>Course 1</b>								
<b>Course 2</b>								
<b>Course 3</b>								
<b>Course 4</b>								
<b>Course 5</b>								
<b>Course 6</b>								
<b>Final exam of module</b>		Erfüllung der Arbeitsaufträge			Klausur oder Hausarbeit oder mündliche Prüfung oder Portfolio			
<b>Exam repetition information</b>								
Module course label	Course type	Course title	SWS	Workload of compulsory attendance	Workload of preparation / homework etc	Workload of independent learning	Workload (examination and preparation)	Sum workload
<b>Course 1</b>	Lecture	Vorlesung		1				0
<b>Course 2</b>	Exercises	Computerübung		3				0
<b>Course 3</b>	Course	Vor- und Nachbereitung Vorlesung						0
<b>Course 4</b>	Course	Vor- und Nachbereitung Übung						0
<b>Course 5</b>	Course	Erfüllung der Arbeitsaufträge						0
<b>Course 6</b>	Course	Vorbereitung Modulleistung						0
<b>Workload by module</b>						150		150
<b>Total module workload</b>								150

## GEO.07226.02 - Social-Ecological Systems 4: Academic Writing II

GEO.07226.02		5 CP
<b>Module label</b>	Social-Ecological Systems 4: Academic Writing II	
<b>Module code</b>	GEO.07226.02	
<b>Semester of first implementation</b>		
<b>Module used in courses of study / semesters</b>	<ul style="list-style-type: none"> <li>Biodiversity Sciences (MA120 LP) (Master) &gt; Biologie BiodiversityMA120, Version of accreditation valid from SS 2021 &gt; Project modules offered by the Institute of Geosciences and Geography (Nat Sci III)</li> <li>International Area Studies - Global Change Geography (MA120 LP) (Master) &gt; Geographie/Erdkunde IntArStudGlobChaGeoMA120, Version of accreditation valid from SS 2021 &gt; Schwerpunkt- oder Ergänzungsbereich: Social-Ecological Systems (SES)</li> </ul>	
<b>Responsible person for this module</b>		
<b>Further responsible persons</b>	Prof. Dr. Christine Fürst	
<b>Prerequisites</b>		
<b>Skills to be acquired in this module</b>	<ul style="list-style-type: none"> <li>Entwicklung fortgeschrittener Fähigkeiten zur Strukturierung und Gliederung wissenschaftlicher Texte, einschließlich Forschungsartikeln und Literaturreviews</li> <li>Verbesserung der Beherrschung der Konventionen des akademischen Schreibens, wie Klarheit, Kohärenz und logischer Fluss</li> <li>Verbesserung der Beherrschung der englischen Sprache (AE) für die wissenschaftliche Kommunikation, einschließlich Grammatik, Wortschatz und Stil</li> </ul> <p>Verstehen der Unterschiede zwischen amerikanischem Englisch (AE) und britischem Englisch (BE) im wissenschaftlichen Schreiben und die Fähigkeit, sich darin zurechtzufinden Erwerb der Fähigkeit, selbstständig verschiedene wissenschaftliche Textformate zu entwickeln, wie z.B. Forschungsanträge, Konferenzabstracts und Projektberichte</p>	
<b>Module contents</b>	<ul style="list-style-type: none"> <li>Gliederung und Evaluierungskriterien von Fachpublikationen in unterschiedlichen Kontexten</li> <li>Autorenanforderungen und Zitierstile</li> <li>Differenzierung von AE / BE und grammatikalische Regelungen, Fachtermini</li> <li>Verschiedene Formen wissenschaftlicher Publikationen (Editorial Requests)</li> </ul>	
<b>Forms of instruction</b>	Lecture (1 SWS) Exercises (3 SWS) Course Course Course Course	
<b>Languages of instruction</b>	German, English	
<b>Duration (semesters)</b>	1 Semester Semester	
<b>Module frequency</b>	beginnend im Wintersemester im Wechsel mit	
<b>Module capacity</b>	unlimited	
<b>Time of examination</b>		
<b>Credit points</b>	5 CP	
<b>Share on module final degree</b>	Course 1: %; Course 2: %; Course 3: %; Course 4: %; Course 5: %; Course 6: %.	
<b>Share of module grade on the course of study's final grade</b>	1	
Examination	Exam prerequisites	Type of examination
<b>Course 1</b>		
<b>Course 2</b>		

Examination		Exam prerequisites			Type of examination			
<b>Course 3</b>								
<b>Course 4</b>								
<b>Course 5</b>								
<b>Course 6</b>								
<b>Final exam of module</b>		Erfüllung der Arbeitsaufträge			Hausarbeit			
<b>Exam repetition information</b>								
Module course label	Course type	Course title	SWS	Workload of compulsory attendance	Workload of preparation / homework etc	Workload of independent learning	Workload (examination and preparation)	Sum workload
<b>Course 1</b>	Lecture	Vorlesung		1				0
<b>Course 2</b>	Exercises	Übung		3				0
<b>Course 3</b>	Course	Vor- und Nachbereitung Vorlesung						0
<b>Course 4</b>	Course	Vor- und Nachbereitung Übung						0
<b>Course 5</b>	Course	Erfüllung Arbeitsaufträge						0
<b>Course 6</b>	Course	Vorbereitung Modulleistung						0
<b>Workload by module</b>						150		150
<b>Total module workload</b>								150

## GEO.07239.02 - Land System Science 2: Climate and Ecosystems

GEO.07239.02

5 CP

<b>Module label</b>	Land System Science 2: Climate and Ecosystems
<b>Module code</b>	GEO.07239.02
<b>Semester of first implementation</b>	
<b>Module used in courses of study / semesters</b>	<ul style="list-style-type: none"> <li>• Angewandte Geowissenschaften (Applied Geosciences) (MA120 LP) (Master) &gt; Geowissenschaften Angew. Geowissensch.MA120, Version of accreditation valid from WS 2021/22 &gt; Wahlpflichtmodule Nebenfächer</li> <li>• Biodiversity Sciences (MA120 LP) (Master) &gt; Biologie BiodiversityMA120, Version of accreditation valid from SS 2021 &gt; Project modules offered by the Institute of Geosciences and Geography (Nat Sci III)</li> <li>• International Area Studies - Global Change Geography (MA120 LP) (Master) &gt; Geographie/Erdkunde IntArStudGlobChaGeoMA120, Version of accreditation valid from SS 2021 &gt; Schwerpunkt- oder Ergänzungsbereich: Land Systems Science (LSS)</li> <li>• Management natürlicher Ressourcen (MA120 LP) (Master) &gt; Landespflege/Landschaftsgestaltung Management nat.RessoMA120, Version of accreditation valid from WS 2021/22 &gt; Wahlpflichtbereich</li> </ul>
<b>Responsible person for this module</b>	
<b>Further responsible persons</b>	Prof. Dr. Christopher Conrad
<b>Prerequisites</b>	
<b>Skills to be acquired in this module</b>	<ul style="list-style-type: none"> <li>• Vertiefendes Fachwissen zur Klimageographie und zu Klimawandel sammeln, erweitern und diskutieren</li> <li>• Messung von Klimavariablen und Modellierung von Klima beschreiben, interpretieren und im Kontext von Klimawandel bewerten</li> <li>• Ursache-Wirkungsgefügen zu Klimawandel, Auswirkungen und möglichen Anpassungsmaßnahmen (Mensch-Umwelt-Beziehung) selbständig analysieren</li> <li>• Klimatische Veränderungen auf verschiedene Ökosysteme und darin lebende und wirtschaftende Sektoren identifizieren, strukturiert beschreiben und diskutieren sowie hinsichtlich der Stärke und Art der Auswirkungen kategorisieren und einschätzen</li> <li>• Klimamessdaten und Projektionen selbständig analysieren</li> <li>• die Aussagekraft von Geodaten zu Klima- und Klimawandel anhand erworbener Kenntnisse zu Unsicherheiten und deren Quellen eigenständig und korrekt beurteilen</li> <li>• Unter Anleitung Quellcode für die Analyse von Klimaindikatoren entwickeln</li> </ul>
<b>Module contents</b>	<ul style="list-style-type: none"> <li>• Zusammenfassungen zu Klimageographie und Klimawandel</li> <li>• Hintergrundwissen Klimamodellierung: Technische Grundlagen, Modelltypen, Projektionen und Szenarios</li> <li>• Analyse der Ursache-Wirkungsketten hinsichtlich der Auswirkungen des Klimawandel auf verschiedene Ökosysteme und Sektoren anhand von Indikatoren und Indikatorensystemen</li> <li>• Technischer Zugang zu Datenportalen und Aufbereitung von Klimamessdaten und Klimaprojektionen</li> <li>• Analyse und Visualisierung von Klimadaten: Klimadiagramme, Häufigkeitsverteilungen, Trend- und Zusammenhangsanalysen</li> </ul>
<b>Forms of instruction</b>	Lecture (2 SWS) Tutorial (2 SWS) Course Course Course
<b>Languages of instruction</b>	German, English
<b>Duration (semesters)</b>	1 Semester Semester
<b>Module frequency</b>	jedes Wintersemester

GEO.07239.02 5 CP

<b>Module capacity</b>		unlimited						
<b>Time of examination</b>								
<b>Credit points</b>		5 CP						
<b>Share on module final degree</b>		Course 1: %; Course 2: %; Course 3: %; Course 4: %; Course 5: %.						
<b>Share of module grade on the course of study's final grade</b>		1						
Examination			Exam prerequisites			Type of examination		
<b>Course 1</b>								
<b>Course 2</b>								
<b>Course 3</b>								
<b>Course 4</b>								
<b>Course 5</b>								
<b>Final exam of module</b>			Übungsaufgabe(n)			Hausarbeit oder Präsentation		
<b>Exam repetition information</b>								
Module course label	Course type	Course title	SWS	Workload of compulsory attendance	Workload of preparation / homework etc	Workload of independent learning	Workload (examination and preparation)	Sum workload
<b>Course 1</b>	Lecture	Vorlesung		2				0
<b>Course 2</b>	Tutorial	Tutorium		2				0
<b>Course 3</b>	Course	Vor- und Nachbereitung Vorlesung						0
<b>Course 4</b>	Course	Bearbeitung von Übungsaufgaben						0
<b>Course 5</b>	Course	Vorbereitung der Modulleistung						0
<b>Workload by module</b>						150		150
<b>Total module workload</b>								150

## GEO.07223.03 - Social-Ecological Systems 1: Spatial Modelling, Scenario Development and Impact Assessment I

GEO.07223.03 10 CP

<b>Module label</b>	Social-Ecological Systems 1: Spatial Modelling, Scenario Development and Impact Assessment I
<b>Module code</b>	GEO.07223.03
<b>Semester of first implementation</b>	
<b>Module used in courses of study / semesters</b>	<ul style="list-style-type: none"> <li>Biodiversity Sciences (MA120 LP) (Master) &gt; Biologie BiodiversityMA120, Version of accreditation valid from SS 2021 &gt; Project modules offered by the Institute of Geosciences and Geography (Nat Sci III)</li> <li>International Area Studies - Global Change Geography (MA120 LP) (Master) &gt; Geographie/Erdkunde IntArStudGlobChaGeoMA120, Version of accreditation valid from SS 2021 &gt; Schwerpunkt- oder Ergänzungsbereich: Social-Ecological Systems (SES)</li> </ul>
<b>Responsible person for this module</b>	
<b>Further responsible persons</b>	Prof. Dr. Christine Fürst
<b>Prerequisites</b>	
<b>Skills to be acquired in this module</b>	<ul style="list-style-type: none"> <li>Erwerb von Kenntnissen über die integrative Modellierung von Systemprozessen auf verschiedenen Ebenen, einschließlich der Fähigkeit, die Grundsätze und Techniken der Systemmodellierung im Zusammenhang mit sozial-ökologischen Systemen zu verstehen und anzuwenden</li> <li>Entwicklung eines umfassenden Verständnisses von Theorien und Modellen sozial-ökologischer Systeme und verwandter Konzepte, einschließlich der Fähigkeit, ihre Anwendbarkeit und ihre Grenzen kritisch zu beurteilen und zu bewerten</li> <li>Erwerb von Kenntnissen über Szenariotechniken und multikriterielle Bewertungsverfahren, einschließlich der Fähigkeit, Szenarien zu entwerfen und umzusetzen und ihre Auswirkungen auf sozial-ökologische Systeme anhand geeigneter Kriterien zu bewerten</li> <li>Entwicklung praktischer Fähigkeiten bei der Anwendung von Modellen auf verschiedene Fallbeispiele, einschließlich der Fähigkeit, geeignete Modelle auszuwählen und anzupassen, relevante Daten zu sammeln und zu analysieren und die Ergebnisse effektiv zu interpretieren und zu kommunizieren</li> </ul>
<b>Module contents</b>	<ul style="list-style-type: none"> <li>Komplexe Systeme und deren Modellrepräsentation</li> <li>Räumlich inexplizite und explizite Modellierungsansätze</li> <li>Partizipative und datengetriebene Szenariotechniken</li> <li>Integration multikriterieller Ansätze in die integrierte Bewertung von Szenarien</li> </ul>
<b>Forms of instruction</b>	Lecture (2 SWS) Exercises (2 SWS) Course Course Course Course
<b>Languages of instruction</b>	German, English
<b>Duration (semesters)</b>	1 Semester Semester
<b>Module frequency</b>	jedes Wintersemester
<b>Module capacity</b>	unlimited
<b>Time of examination</b>	
<b>Credit points</b>	10 CP
<b>Share on module final degree</b>	Course 1: %; Course 2: %; Course 3: %; Course 4: %; Course 5: %; Course 6: %.
<b>Share of module grade on the course of study's final grade</b>	1



Examination		Exam prerequisites			Type of examination			
<b>Course 1</b>								
<b>Course 2</b>								
<b>Course 3</b>								
<b>Course 4</b>								
<b>Course 5</b>								
<b>Course 6</b>								
<b>Final exam of module</b>		Erfüllung der Arbeitsaufträge			Klausur oder Hausarbeit oder mündliche Prüfung oder Portfolio			
<b>Exam repetition information</b>								
Module course label	Course type	Course title	SWS	Workload of compulsory attendance	Workload of preparation / homework etc	Workload of independent learning	Workload (examination and preparation)	Sum workload
<b>Course 1</b>	Lecture	Vorlesung		2				0
<b>Course 2</b>	Exercises	Computerübung		2				0
<b>Course 3</b>	Course	Vor- und Nachbereitung Vorlesung						0
<b>Course 4</b>	Course	Vor- und Nachbereitung Übung						0
<b>Course 5</b>	Course	Erfüllung der Arbeitsaufgaben						0
<b>Course 6</b>	Course	Vorbereitung Modulleistung						0
<b>Workload by module</b>						300		300
<b>Total module workload</b>								300

## Project modules offered by the Inst. of Agricultural and Nutrition Sciences (Nat Sci III)

### AGE.06079.03 - Matter and material flow analysis

AGE.06079.03	5 CP
<b>Module label</b>	Matter and material flow analysis
<b>Module code</b>	AGE.06079.03
<b>Semester of first implementation</b>	
<b>Module used in courses of study / semesters</b>	<ul style="list-style-type: none"> <li>Biodiversity Sciences (MA120 LP) (Master) &gt; Biologie BiodiversityMA120, Version of accreditation valid from SS 2021 &gt; Project modules offered by the Inst. of Agricultural and Nutrition Sciences (Nat Sci III)</li> <li>Management natürlicher Ressourcen (MA120 LP) (Master) &gt; Landespflege/Landschaftsgestaltung Management nat.RessoMA120, Version of accreditation valid from WS 2021/22 &gt; Wahlpflichtbereich</li> <li>Management natürlicher Ressourcen (MA120 LP) (Master) &gt; Landespflege/Landschaftsgestaltung Management nat.RessoMA120, Version of accreditation (WS 2015/16 - SS 2018) &gt; Wahlpflichtmodule</li> <li>Management natürlicher Ressourcen (MA120 LP) (Master) &gt; Landespflege/Landschaftsgestaltung Management nat.RessoMA120, Version of accreditation (WS 2018/19 - SS 2021) &gt; Wahlpflichtmodule (60 LP - empfohlen werden im 1., 2. und 3. Semester je 20 LP)</li> </ul>
<b>Responsible person for this module</b>	
<b>Further responsible persons</b>	Prof. Dr. Bruno Glaser
<b>Prerequisites</b>	
<b>Skills to be acquired in this module</b>	<ul style="list-style-type: none"> <li>nach dem Besuch des Moduls wird erwartet, dass die Studierenden in der Lage sind:</li> <li>Entwicklung der Fähigkeit, Kreisläufe des Stoffflusses in Ökosystemen zu erkennen und ihre Wechselwirkungen zu verstehen.</li> <li>Erwerb von Kenntnissen über die Hauptprozesse in den C- N- P- und S- Kreisläufen und darüber, wie menschliche Aktivitäten diese Kreisläufe beeinflussen können.</li> <li>Erwerb von Kenntnissen in der Anwendung moderner Untersuchungsmethoden, wie z.B. stabiler Isotopentechniken, zur Untersuchung und Analyse ökologischer Systeme.</li> <li>Entwicklung der Fähigkeiten, ökologische Studien und Modelle zu analysieren und zu bewerten und diese in den Kontext wissenschaftlicher Zusammenhänge einzuordnen.</li> <li>Ein kleines wissenschaftliches Projekt eigenständig zur Analyse von Materie und Stoffflüssen in Ökosystemen zu entwerfen und durchzuführen.</li> </ul>
<b>Module contents</b>	<ul style="list-style-type: none"> <li>Einführung in globale Stoffkreisläufe</li> <li>Prozesse der Stoffkreisläufe und deren Regulation</li> <li>Bedeutung des Menschen für Stoffkreisläufe</li> <li>Methoden zur Bestimmung von Stoffflüssen und Bilanzierung</li> <li>Ansätze zur Modellierung von Stoffkreisläufe</li> </ul>
<b>Forms of instruction</b>	Lecture (2 SWS) Course Exercises (2 SWS) Course Course
<b>Languages of instruction</b>	German, English
<b>Duration (semesters)</b>	1 Semester Semester
<b>Module frequency</b>	jedes Wintersemester
<b>Module capacity</b>	unlimited

AGE.06079.03

5 CP

<b>Time of examination</b>								
<b>Credit points</b>		5 CP						
<b>Share on module final degree</b>		Course 1: %; Course 2: %; Course 3: %; Course 4: %; Course 5: %.						
<b>Share of module grade on the course of study's final grade</b>		1						
<b>Reference text</b>		Für dieses Modul ist die Teilnahme an der Übung und die Ableistung einer Projektarbeit Pflicht.						
Examination		Exam prerequisites			Type of examination			
<b>Course 1</b>								
<b>Course 2</b>								
<b>Course 3</b>								
<b>Course 4</b>								
<b>Course 5</b>								
<b>Final exam of module</b>		Klausur oder Hausarbeit oder mündliche Prüfung						
<b>Exam repetition information</b>								
Module course label	Course type	Course title	SWS	Workload of compulsory attendance	Workload of preparation / homework etc	Workload of independent learning	Workload (examination and preparation)	Sum workload
<b>Course 1</b>	Lecture	Vorlesung		2				0
<b>Course 2</b>	Course	Selbststudium						0
<b>Course 3</b>	Exercises	Übung		2				0
<b>Course 4</b>	Course	Selbststudium						0
<b>Course 5</b>	Course	Projektarbeit						0
<b>Workload by module</b>						150		150
<b>Total module workload</b>								150

## AGE.06353.04 - Soil Biogeochemical analysis

AGE.06353.04	5 CP
<b>Module label</b>	Soil Biogeochemical analysis
<b>Module code</b>	AGE.06353.04
<b>Semester of first implementation</b>	
<b>Module used in courses of study / semesters</b>	<ul style="list-style-type: none"> <li>• Biodiversity Sciences (MA120 LP) (Master) &gt; Biologie Biodiversity/MA120, Version of accreditation valid from SS 2021 &gt; Project modules offered by the Inst. of Agricultural and Nutrition Sciences (Nat Sci III)</li> <li>• Management natürlicher Ressourcen (MA120 LP) (Master) &gt; Landespflege/Landschaftsgestaltung Management nat.Resso/MA120, Version of accreditation valid from WS 2021/22 &gt; Wahlpflichtbereich</li> <li>• Management natürlicher Ressourcen (MA120 LP) (Master) &gt; Landespflege/Landschaftsgestaltung Management nat.Resso/MA120, Version of accreditation (WS 2015/16 - SS 2018) &gt; Wahlpflichtmodule</li> <li>• Management natürlicher Ressourcen (MA120 LP) (Master) &gt; Landespflege/Landschaftsgestaltung Management nat.Resso/MA120, Version of accreditation (WS 2018/19 - SS 2021) &gt; Wahlpflichtmodule (60 LP - empfohlen werden im 1., 2. und 3. Semester je 20 LP)</li> </ul>
<b>Responsible person for this module</b>	
<b>Further responsible persons</b>	Prof. Dr. Bruno Glaser
<b>Prerequisites</b>	
<b>Skills to be acquired in this module</b>	<ul style="list-style-type: none"> <li>• Nach dem Besuch des Moduls wird erwartet, dass die Studierenden in der Lage:</li> <li>• Erwerb von Kenntnissen und Verständnis für die verschiedenen Schritte der bodenökologischen Forschung, einschließlich der Identifizierung und Untersuchung spezifischer Aspekte biogeochemischer Kreisläufe und des Schadstofftransfers in terrestrischen Ökosystemen.</li> <li>• selbstständiges Durchführen eines ökologisch relevanten Forschungsprojekts, einschließlich der Formulierung von Forschungsfragen, der Entwicklung von Probenahme-strategien für Bodenproben und der Sammlung relevanter Daten.</li> <li>• Entwicklung der Fähigkeiten zur Anwendung instrumenteller Analysemethoden, die üblicherweise in der Bodenbiogeochemie verwendet werden, und der Kompetenz in deren Einsatz für die Analyse von Bodenproben und die Interpretation der Ergebnisse.</li> <li>• Wissenschaftliche Literatur zur Bodenbiogeochemie kritisch bewerten und interpretieren und dabei ein tiefes Verständnis der Schlüsselkonzepte und Methoden auf diesem Gebiet nachweisen.</li> <li>• Präsentation der Grundlagen der Bodenbiogeochemie und ihrer Forschungsergebnisse durch mündliche Präsentationen und Projektberichte.</li> </ul>
<b>Module contents</b>	<ul style="list-style-type: none"> <li>• In einer kurzen Vorlesung wird in die jeweilige bodenbiogeochemische Thematik eingeführt. (Inhalte orientieren sich an aktuellen Themen).</li> <li>• Danach werden die praktischen Laborübungen durchgeführt.</li> <li>• Hierauf folgt die Datenauswertung und -Interpretation.</li> <li>• Die Ergebnisse werden in einem Abschluss-Seminar präsentiert und diskutiert.</li> </ul>
<b>Forms of instruction</b>	Lecture (1 SWS) Course (3 SWS) Course
<b>Languages of instruction</b>	German, English
<b>Duration (semesters)</b>	1 Semester Semester
<b>Module frequency</b>	jedes Studienjahr beginnend im Wintersemester
<b>Module capacity</b>	unlimited
<b>Time of examination</b>	

AGE.06353.04

5 CP

<b>Credit points</b>		5 CP						
<b>Share on module final degree</b>		Course 1: %; Course 2: %; Course 3: %.						
<b>Share of module grade on the course of study's final grade</b>		1						
Examination		Exam prerequisites			Type of examination			
<b>Course 1</b>								
<b>Course 2</b>								
<b>Course 3</b>								
<b>Final exam of module</b>		Referat oder Projektarbeitsbericht						
<b>Exam repetition information</b>								
Module course label	Course type	Course title	SWS	Workload of compulsory attendance	Workload of preparation / homework etc	Workload of independent learning	Workload (examination and preparation)	Sum workload
<b>Course 1</b>	Lecture	Vorlesung und Abschluss-Seminar	1					0
<b>Course 2</b>	Course	Laborübungen	3					0
<b>Course 3</b>	Course	Selbststudium						0
<b>Workload by module</b>						150		150
<b>Total module workload</b>								150

## AGE.06083.03 - Management of soil organic matter

AGE.06083.03

5 CP

<b>Module label</b>	Management of soil organic matter
<b>Module code</b>	AGE.06083.03
<b>Semester of first implementation</b>	
<b>Module used in courses of study / semesters</b>	<ul style="list-style-type: none"> <li>• Biodiversity Sciences (MA120 LP) (Master) &gt; Biologie BiodiversityMA120, Version of accreditation valid from SS 2021 &gt; Project modules offered by the Inst. of Agricultural and Nutrition Sciences (Nat Sci III)</li> <li>• Management natürlicher Ressourcen (MA120 LP) (Master) &gt; Landespflge/Landschaftsgestaltung Management nat.RessoMA120, Version of accreditation valid from WS 2021/22 &gt; Wahlpflichtbereich</li> <li>• Management natürlicher Ressourcen (MA120 LP) (Master) &gt; Landespflge/Landschaftsgestaltung Management nat.RessoMA120, Version of accreditation (WS 2015/16 - SS 2018) &gt; Wahlpflichtmodule</li> <li>• Management natürlicher Ressourcen (MA120 LP) (Master) &gt; Landespflge/Landschaftsgestaltung Management nat.RessoMA120, Version of accreditation (WS 2018/19 - SS 2021) &gt; Wahlpflichtmodule (60 LP - empfohlen werden im 1., 2. und 3. Semester je 20 LP)</li> </ul>
<b>Responsible person for this module</b>	
<b>Further responsible persons</b>	Prof. Dr. Bruno Glaser
<b>Prerequisites</b>	
<b>Skills to be acquired in this module</b>	<ul style="list-style-type: none"> <li>• Nach dem Besuch des Moduls wird erwartet, dass die Studierenden in der Lage sind:</li> <li>• Erwerb der Fähigkeit, die Bedeutung organischer Bodensubstanz im Kontext der Erhaltung der biologischen Vielfalt und der nachhaltigen Landwirtschaft kritisch zu bewerten.</li> <li>• Erwerb von Kenntnissen über die verschiedenen Faktoren, die die Dynamik organischer Bodensubstanz beeinflussen, und deren Auswirkungen auf die Funktionsweise und Dienstleistungen des Ökosystems.</li> <li>• Erwerb von Kenntnissen in der Anwendung moderner Untersuchungsmethoden, wie z.B. stabiler Isotopentechniken, zur Untersuchung und Analyse ökologischer Systeme.</li> <li>• Erwerb praktischer Fähigkeiten zur Messung und Überwachung des Gehalts an organischer Bodensubstanz sowie zur Analyse und Interpretation der Daten mithilfe geeigneter statistischer Techniken.</li> <li>• Entwurf und Umsetzung eines Forschungsprojekts im Zusammenhang mit der Bewirtschaftung organischer Bodensubstanz, einschließlich der Formulierung von Forschungsfragen, der Gestaltung von Experimenten oder Umfragen sowie der Erhebung und Analyse von Daten.</li> </ul>
<b>Module contents</b>	<ul style="list-style-type: none"> <li>• Der Einfluss von Umweltveränderungen auf die Möglichkeiten des nachhaltigen Managements werden aufgezeigt.</li> <li>• Indikatoren für die Möglichkeiten von Böden als Kohlenstoffquellen und -senken werden aufgezeigt.</li> </ul>
<b>Forms of instruction</b>	Lecture Seminar (2 SWS) Course Exercises Course
<b>Languages of instruction</b>	German, English
<b>Duration (semesters)</b>	1 Semester Semester
<b>Module frequency</b>	jedes Sommersemester
<b>Module capacity</b>	unlimited

AGE.06083.03

5 CP

<b>Time of examination</b>								
<b>Credit points</b>		5 CP						
<b>Share on module final degree</b>		Course 1: %; Course 2: %; Course 3: %; Course 4: %; Course 5: %.						
<b>Share of module grade on the course of study's final grade</b>		1						
<b>Reference text</b>		Für dieses Modul ist die Teilnahme am Seminar und die Ableistung einer Projektarbeit Pflicht.						
Examination	Exam prerequisites	Type of examination						
<b>Course 1</b>								
<b>Course 2</b>								
<b>Course 3</b>								
<b>Course 4</b>								
<b>Course 5</b>								
<b>Final exam of module</b>		Klausur oder Hausarbeit und mündliche Prüfung						
<b>Exam repetition information</b>								
Module course label	Course type	Course title	SWS	Workload of compulsory attendance	Workload of preparation / homework etc	Workload of independent learning	Workload (examination and preparation)	Sum workload
<b>Course 1</b>	Lecture	Vorlesung						0
<b>Course 2</b>	Seminar	Seminar	2					0
<b>Course 3</b>	Course	Vor-/Nachbereitung Seminar						0
<b>Course 4</b>	Exercises	Übung						0
<b>Course 5</b>	Course	Selbststudium						0
<b>Workload by module</b>						150		150
<b>Total module workload</b>								150

## Project modules offered by the Institute of Computer Science (Nat Sci III)

### INF.07653.03 - Computational Sequence Analysis

INF.07653.03		5 CP
<b>Module label</b>	Computational Sequence Analysis	
<b>Module code</b>	INF.07653.03	
<b>Semester of first implementation</b>		
<b>Module used in courses of study / semesters</b>	<ul style="list-style-type: none"> <li>Biodiversity Sciences (MA120 LP) (Master) &gt; Biologie BiodiversityMA120, Version of accreditation valid from SS 2021 &gt; Project modules offered by the Institute of Computer Science (Nat Sci III)</li> </ul>	
<b>Responsible person for this module</b>		
<b>Further responsible persons</b>	Prof. Dr. Ivo Große	
<b>Prerequisites</b>	Statistical Data Analysis and Machine Learning in Biodiversity Research	
<b>Skills to be acquired in this module</b>	<ul style="list-style-type: none"> <li>Acquire an understanding of the fundamental principles and techniques of computational sequence analysis.</li> <li>Being capable to critically evaluate and select appropriate computational sequence analysis approaches for addressing specific scientific problems in sequence analysis.</li> <li>Gaining the ability to effectively communicate and explain computational sequence analysis approaches to both technical and non-technical audiences including their limitations and implications of their findings.</li> <li>Having competence of developing and advancing these approaches further for application to new and emerging scientific challenges in sequence analysis.</li> </ul>	
<b>Module contents</b>	Expectation-maximization algorithm, Baum-Welch algorithm for Hidden Markov Models, Gibbs-sampling algorithm Computational recognition of splice sites Computational recognition of cis-elements and cis-regulatory modules	
<b>Forms of instruction</b>	Lecture (2 SWS) Course Exercises (2 SWS) Exercises	
<b>Languages of instruction</b>	German, English	
<b>Duration (semesters)</b>	1 Semester Semester	
<b>Module frequency</b>	jedes Wintersemester	
<b>Module capacity</b>	unlimited	
<b>Time of examination</b>		
<b>Credit points</b>	5 CP	
<b>Share on module final degree</b>	Course 1: %; Course 2: %; Course 3: %; Course 4: %.	
<b>Share of module grade on the course of study's final grade</b>	1	
Examination	Exam prerequisites	Type of examination
<b>Course 1</b>		
<b>Course 2</b>		
<b>Course 3</b>		
<b>Course 4</b>		
<b>Final exam of module</b>	Aktive Teilnahme an den Übungen, Erfolgreiches Lösen der Übungs- und Programmieraufgaben, Erfolgreiches Vorrechnen und Erklären der Lösungen, 50% der Punkte der Übungsaufgaben	mündl. Prüfung oder Klausur
<b>Exam repetition information</b>		



Module course label	Course type	Course title	SWS	Workload of compulsory attendance	Workload of preparation / homework etc	Workload of independent learning	Workload (examination and preparation)	Sum workload
<b>Course 1</b>	Lecture	Vorlesung		2				0
<b>Course 2</b>	Course	Selbststudium						0
<b>Course 3</b>	Exercises	Übung		2				0
<b>Course 4</b>	Exercises	Bearbeiten der Übungsaufgaben						0
<b>Workload by module</b>						150		150
<b>Total module workload</b>								150

## INF.07651.02 - Computational Transcriptomics

INF.07651.02		5 CP
<b>Module label</b>	Computational Transcriptomics	
<b>Module code</b>	INF.07651.02	
<b>Semester of first implementation</b>		
<b>Module used in courses of study / semesters</b>	<ul style="list-style-type: none"> <li>Biodiversity Sciences (MA120 LP) (Master) &gt; Biologie Biodiversity/MA120, Version of accreditation valid from SS 2021 &gt; Project modules offered by the Institute of Computer Science (Nat Sci III)</li> </ul>	
<b>Responsible person for this module</b>		
<b>Further responsible persons</b>	Prof. Dr. Ivo Große	
<b>Prerequisites</b>	Statistical Data Analysis and Machine Learning in Biodiversity Research	
<b>Skills to be acquired in this module</b>	<ul style="list-style-type: none"> <li>Acquire an understanding of the fundamental principles and techniques of computational transcriptomics.</li> <li>Being capable to critically evaluate and select appropriate computational transcriptomics approaches for addressing specific scientific problems transcriptomics.</li> <li>Gaining the ability to effectively communicate and explain computational transcriptomics approaches to both technical and non-technical audiences including their limitations and implications of their findings.</li> <li>Having competence of developing and advancing these approaches further for application to new and emerging scientific challenges in transcriptomics.</li> </ul>	
<b>Module contents</b>	Technology und data acquisition Popular distance and dissimilarity measures and hierarchical clustering Partitioning clustering and k-means algorithm Expectation-maximization algorithm und Gibbs-sampling algorithm for Gaussian mixture models Prediction of differentially expressed genes, exons, and isoforms	
<b>Forms of instruction</b>	Lecture (2 SWS) Course Exercises (2 SWS) Exercises	
<b>Languages of instruction</b>	German, English	
<b>Duration (semesters)</b>	1 Semester Semester	
<b>Module frequency</b>	jedes Sommersemester	
<b>Module capacity</b>	unlimited	
<b>Time of examination</b>		
<b>Credit points</b>	5 CP	
<b>Share on module final degree</b>	Course 1: %; Course 2: %; Course 3: %; Course 4: %.	
<b>Share of module grade on the course of study's final grade</b>	1	
Examination	Exam prerequisites	Type of examination
<b>Course 1</b>		
<b>Course 2</b>		
<b>Course 3</b>		
<b>Course 4</b>		
<b>Final exam of module</b>	Aktive Teilnahme an den Übungen, Erfolgreiches Lösen der Übungs- und Programmieraufgaben, Erfolgreiches Vorrechnen und Erklären der Lösungen, 50% der Punkte der Übungsaufgaben	mündl. Prüfung oder Klausur
<b>Exam repetition information</b>		

Module course label	Course type	Course title	SWS	Workload of compulsory attendance	Workload of preparation / homework etc	Workload of independent learning	Workload (examination and preparation)	Sum workload
<b>Course 1</b>	Lecture	Vorlesung		2				0
<b>Course 2</b>	Course	Selbststudium						0
<b>Course 3</b>	Exercises	Übung		2				0
<b>Course 4</b>	Exercises	Bearbeiten der Übungsaufgaben						0
<b>Workload by module</b>						150		150
<b>Total module workload</b>								150

## INF.07654.02 - Statistical Data Analysis and Machine Learning in Biodiversity Research

INF.07654.02	5 CP	
<b>Module label</b>	Statistical Data Analysis and Machine Learning in Biodiversity Research	
<b>Module code</b>	INF.07654.02	
<b>Semester of first implementation</b>		
<b>Module used in courses of study / semesters</b>	<ul style="list-style-type: none"> <li>Biodiversity Sciences (MA120 LP) (Master) &gt; Biologie BiodiversityMA120, Version of accreditation valid from SS 2021 &gt; Project modules offered by the Institute of Computer Science (Nat Sci III)</li> </ul>	
<b>Responsible person for this module</b>		
<b>Further responsible persons</b>	Prof. Dr. Ivo Große	
<b>Prerequisites</b>		
<b>Skills to be acquired in this module</b>	<ul style="list-style-type: none"> <li>Acquire an understanding of the fundamental principles and techniques of statistical data analysis and machine learning in bioinformatics and biodiversity research.</li> <li>Being capable to critically evaluate and select appropriate statistical data analysis and machine learning approaches for addressing specific scientific problems in bioinformatics and biodiversity research.</li> <li>Gaining the ability to effectively communicate and explain statistical data analysis and machine learning approaches to both technical and non-technical audiences including their limitations and implications of their findings.</li> <li>Having competence of developing and advancing these approaches further for application to new and emerging scientific challenges in bioinformatics and biodiversity research.</li> </ul>	
<b>Module contents</b>	<ul style="list-style-type: none"> <li>Statistical inference; ML, MAP, MP estimators; bias, variance, consistency, efficiency of estimators</li> <li>Markov models; ML, MAP, MP estimators; sequence logos; applications in bioinformatics and biodiversity research</li> <li>Hidden Markov models; Viterbi algorithm, forward-backward algorithm; applications in bioinformatics and biodiversity research</li> <li>Model selection; model averaging; classification; applications in bioinformatics and biodiversity research</li> </ul>	
<b>Forms of instruction</b>	Lecture (2 SWS) Course Exercises (2 SWS) Exercises	
<b>Languages of instruction</b>	German, English	
<b>Duration (semesters)</b>	1 Semester Semester	
<b>Module frequency</b>	jedes Sommersemester	
<b>Module capacity</b>	unlimited	
<b>Time of examination</b>		
<b>Credit points</b>	5 CP	
<b>Share on module final degree</b>	Course 1: %; Course 2: %; Course 3: %; Course 4: %.	
<b>Share of module grade on the course of study's final grade</b>	1	
Examination	Exam prerequisites	Type of examination
<b>Course 1</b>		
<b>Course 2</b>		
<b>Course 3</b>		
<b>Course 4</b>		
<b>Final exam of module</b>	Aktive Teilnahme an den Übungen, Erfolgreiches Lösen der Übungs- und Programmieraufgaben,	mündliche Prüfung oder Klausur

Examination			Exam prerequisites			Type of examination		
			Erfolgreiches Vorrechnen und Erklären der Lösungen, 50% der Punkte der Übungsaufgaben					
<b>Exam repetition information</b>								
Module course label	Course type	Course title	SWS	Workload of compulsory attendance	Workload of preparation / homework etc	Workload of independent learning	Workload (examination and preparation)	Sum workload
<b>Course 1</b>	Lecture	Vorlesung		2				0
<b>Course 2</b>	Course	Selbststudium						0
<b>Course 3</b>	Exercises	Übung		2				0
<b>Course 4</b>	Exercises	Bearbeiten der Übungsaufgaben						0
<b>Workload by module</b>						150		150
<b>Total module workload</b>								150

## INF.07652.03 - Computational Molecular Phylogenetics

INF.07652.03		5 CP
<b>Module label</b>	Computational Molecular Phylogenetics	
<b>Module code</b>	INF.07652.03	
<b>Semester of first implementation</b>		
<b>Module used in courses of study / semesters</b>	<ul style="list-style-type: none"> <li>Biodiversity Sciences (MA120 LP) (Master) &gt; Biologie Biodiversity/MA120, Version of accreditation valid from SS 2021 &gt; Project modules offered by the Institute of Computer Science (Nat Sci III)</li> </ul>	
<b>Responsible person for this module</b>		
<b>Further responsible persons</b>	Prof. Dr. Ivo Große	
<b>Prerequisites</b>	Statistical Data Analysis and Machine Learning in Biodiversity Research	
<b>Skills to be acquired in this module</b>	<ul style="list-style-type: none"> <li>Acquire an understanding of the fundamental principles and techniques of computational molecular phylogenetics.</li> <li>Being capable to critically evaluate and select appropriate computational molecular phylogenetics approaches for addressing specific scientific problems in molecular phylogenetics.</li> <li>Gaining the ability to effectively communicate and explain computational molecular phylogenetics approaches to both technical and non-technical audiences including their limitations and implications of their findings.</li> <li>Having competence of developing and advancing these approaches further for application to new and emerging scientific challenges in molecular phylogenetics.</li> </ul>	
<b>Module contents</b>	Molecular basis of evolution, mutations, selection Models of evolution of DNA sequences (Jukes-Cantor, Kimura, Felsenstein, Hasegawa-Kishino-Yano) Models of evolution of RNA expression profiles (Ornstein-Uhlenbeck) Phylogenetic trees and reconstruction of phylogenetic trees Phylogenetic networks and reconstruction of phylogenetic networks	
<b>Forms of instruction</b>	Lecture (2 SWS) Course Exercises (2 SWS) Exercises	
<b>Languages of instruction</b>	German, English	
<b>Duration (semesters)</b>	1 Semester Semester	
<b>Module frequency</b>	jedes Wintersemester	
<b>Module capacity</b>	unlimited	
<b>Time of examination</b>		
<b>Credit points</b>	5 CP	
<b>Share on module final degree</b>	Course 1: %; Course 2: %; Course 3: %; Course 4: %.	
<b>Share of module grade on the course of study's final grade</b>	1	
<b>Examination</b>	<b>Exam prerequisites</b>	<b>Type of examination</b>
<b>Course 1</b>		
<b>Course 2</b>		
<b>Course 3</b>		
<b>Course 4</b>		
<b>Final exam of module</b>	Aktive Teilnahme an den Übungen, Erfolgreiches Lösen der Übungs- und Programmieraufgaben, Erfolgreiches Vorrechnen und Erklären der Lösungen, 50% der Punkte der Übungsaufgaben	mündl. Prüfung oder Klausur
<b>Exam repetition information</b>		

Module course label	Course type	Course title	SWS	Workload of compulsory attendance	Workload of preparation / homework etc	Workload of independent learning	Workload (examination and preparation)	Sum workload
<b>Course 1</b>	Lecture	Vorlesung		2				0
<b>Course 2</b>	Course	Selbststudium						0
<b>Course 3</b>	Exercises	Übung		2				0
<b>Course 4</b>	Exercises	Bearbeiten der Übungsaufgaben						0
<b>Workload by module</b>						150		150
<b>Total module workload</b>								150

## INF.06290.04 - Modelling species distribution and biodiversity patterns

INF.06290.04 15 CP

**Module label** Modelling species distribution and biodiversity patterns

**Module code** INF.06290.04

**Semester of first implementation**

**Module used in courses of study / semesters**

- Biodiversity Sciences (MA120 LP) (Master) > Biologie BiodiversityMA120, Version of accreditation valid from SS 2021 > Project modules offered by the Institute of Computer Science (Nat Sci III)
- Bioinformatik (MA120 LP) (Master) > Bioinformatik BioinformatikMA120, Version of accreditation valid from SoSe 2023 > Bioinformatik (HB) (Anteil gem. § 5 Abs. 4-6, Anlage 2)
- Bioinformatik (MA120 LP) (Master) > Bioinformatik BioinformatikMA120, Version of accreditation (WS 2016/17 - WS 2022/23) > Bioinformatik (HB)
- Biologie (MA120 LP) (Master) > Biologie BiologieMA120, Version of accreditation valid from SoSe 2023 > B2
- Biologie (MA120 LP) (Master) > Biologie BiologieMA120, Version of accreditation (WS 2010/11 - SoSe 2024) > Wahlpflichtmodule

**Responsible person for this module**

**Further responsible persons** Prof. Dr. Jonathan Chase; Prof. Dr. Helge Bruelheide; Dr. Erik Welk

**Prerequisites**

**Skills to be acquired in this module**

- Develop a comprehensive understanding of the models used to describe species distribution and species richness, including their strengths, limitations, and underlying assumptions.
- Demonstrate the ability to critically analyze and compare models results with empirical data, effectively interpret and communicate the implications of these results.
- Acquire a proficient command of the R programming language, enabling the student to write and execute simple programs for processing and analyzing species distribution and biodiversity data.
- Gain competence in the use of GIS software to integrate and manipulate spatial data, create informative maps and analyze spatial patterns in species distribution and biodiversity.
- Develop the skills to effectively read, critically evaluate and engage in discussions about research articles with a strong theoretical or modeling component related to species distribution and biodiversity patterns.

**Module contents** Part I, Introduction to species distribution pattern analysis

- Introduction into GIS: vectorial and raster data; visualizing vectorial and raster data; projections and choice of datum; the attribute table for vectorial data and basic database operations; importing, editing and exporting data; basic spatial operations in GIS (geometric operations and spatial interpolation).
- Mapping methods for plant distribution data; sources, compilation and gathering of plant distribution data; storage and organization of data.
- Introduction to current plant biogeography and macroecological research and the relevant literature; revisiting the niche concept of large scale species distribution ranges
- Introduction to Species Distribution Models; applications and use of plant distribution data;
- Specifics of spatial data in statistical analyses; data preparation and transformations; assumptions of and conditions for spatial analyses of ecological data
- Visualizing spatial data in R
- Practical exercises in plant chorology and macroecology

Part II, Measuring and comparing patterns of biodiversity

- Introduction to biodiversity measures and metrics (e.g., alpha, beta, gamma diversity)
- Species area curves, endemics area curves, other macroecological patterns



- R code for building spatial diversity patterns
- R code for dissecting species richness scaling relationships
- Functional and phylogenetic diversity measures; genetic and network diversity
- Practical exercises for comparing biodiversity variation across natural and anthropogenic gradients

<b>Forms of instruction</b>	Lecture Course Lecture Course Seminar Course Course Course Exercises (1 SWS) Lecture Course Lecture Course Seminar Course Seminar Course Lecture Course Exercises (1 SWS)
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<b>Languages of instruction</b>	German, English
<b>Duration (semesters)</b>	6 Wochen Semester
<b>Module frequency</b>	jedes Wintersemester
<b>Module capacity</b>	unlimited
<b>Time of examination</b>	
<b>Credit points</b>	15 CP
<b>Share on module final degree</b>	Course 1: %; Course 2: %; Course 3: %; Course 4: %; Course 5: %; Course 6: %; Course 7: %; Course 8: %; Course 9: %; Course 10: %; Course 11: %; Course 12: %; Course 13: %; Course 14: %; Course 15: %; Course 16: %; Course 17: %; Course 18: %; Course 19: %; Course 20: %.

<b>Share of module grade on the course of study's final grade</b>	1
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Examination	Exam prerequisites	Type of examination
Course 1		
Course 2		
Course 3		
Course 4		
Course 5		
Course 6		
Course 7		
Course 8		
Course 9		
Course 10		
Course 11		
Course 12		
Course 13		
Course 14		
Course 15		
Course 16		
Course 17		
Course 18		
Course 19		
Course 20		

Examination			Exam prerequisites			Type of examination		
<b>Final exam of module</b>			Part I: Presentation and talks, written report, presentation of statistics and graphs, presentation of own results, Part II: independent project with paper and presentation			Wissenschaftlicher Vortrag Teil I, Wissenschaftlicher Vortrag Teil II, Protokoll, Wissenschaftlicher Vortrag (eigenständiges Projekt)		
<b>Exam repetition information</b>								
Module course label	Course type	Course title	SWS	Workload of compulsory attendance	Workload of preparation / homework etc	Workload of independent learning	Workload (examination and preparation)	Sum workload
<b>Course 1</b>	Lecture	Part I.1 Lecture Introduction to GIS						0
<b>Course 2</b>	Course	Part I.2 Pre and post lecture self study and literature work						0
<b>Course 3</b>	Lecture	Part I.3 Lecture Plant biogeography						0
<b>Course 4</b>	Course	Part I.4 Pre and post lecture self study and literature work						0
<b>Course 5</b>	Seminar	Part I.5 Seminar Current topics in plant biogeography and macroecology						0
<b>Course 6</b>	Course	Part I.6 Pre and post lecture self study and literature work						0
<b>Course 7</b>	Course	Part I.7 Practical course Species distribution modelling						0
<b>Course 8</b>	Course	Part I.8 Pre and post lecture self study and literature work						0
<b>Course 9</b>	Exercises	Part I.9 Practical exercises and independent projects for analyzing species distribution data		1				0
<b>Course 10</b>	Lecture	Part II.1 Lecture and discussion Measuring and comparing patterns of Biodiversity across scales						0
<b>Course 11</b>	Course	Part II.2 Pre and post lecture self study and literature work						0
<b>Course 12</b>	Lecture	Part II.3 Lecture and discussion Species area curves, endemics area curves, other macroecological patterns						0

Module course label	Course type	Course title	SWS	Workload of compulsory attendance	Workload of preparation / homework etc	Workload of independent learning	Workload (examination and preparation)	Sum workload
<b>Course 13</b>	Course	Part II.4 Pre and post lecture self study and literature work						0
<b>Course 14</b>	Seminar	Part II.5 Seminar R code for building spatial diversity patterns						0
<b>Course 15</b>	Course	Part II.6 Pre and post lecture self study and literature work						0
<b>Course 16</b>	Seminar	Part II.7 Seminar R code for dissecting species richness scaling relationships						0
<b>Course 17</b>	Course	Part II.8 Pre and post lecture self study and literature work						0
<b>Course 18</b>	Lecture	Part II.9 Lecture and discussion Functional and phylogenetic diversity measures; genetic and network diversity						0
<b>Course 19</b>	Course	Part II.10 Pre and post lecture self study and literature work						0
<b>Course 20</b>	Exercises	Part II.11 Practical exercises and independent projects for comparing biodiversity variation across natural and anthropogenic gradients		1				0
<b>Workload by module</b>						450		450
<b>Total module workload</b>								450

