Appendix B: Module Catalogue *

of the Master's Degree Course „Landscape Ecology and Nature Conservation"

* This document is a preliminary translation of the "Modulkatalog" of the "Prüfungs- und Studienordnung für den Masterstudiengang "Landscape Ecology and Nature Conservation" at Greifswald University, originally published in German at 01. August 2016 (https://biologie.uni-greifswald.de/fileadmin/uni-greifswald/fakultaet/mnf/biologie/0_bio_general/studium_und_lehre/msc_laoek/PSO_MSc_Landscape_Ecology_and_Nature_Conservation.pdf)

Abbreviations:

LP/ECTS	credit points (ECTS), students workload
SWS	weekly semester hours („Semesterwochenstunden")
*	ungraded exam
E	Excursion
P	Practical
R	Oral presentation
S	Seminar
SoSe	Summer semester
Ü	Excercise
V	Lecture
wo	cumpulsory
WiSe	Winter semester

Basic Module B1: Landscape ecology and economics					
Module responsibility	Leiter AG Landschaftsökologie und Ökosystemdynamik				
Language	English				
Learning outcomes	• The students have acquired knowledge of current conceptual approaches in landscape ecology, and expanded their microeconomic knowledge and applied with respect to the economic evaluation of natural and landscape resources, as well as for the evaluation of interventions of all kinds in the landscape.				
Module content	**Lecture „Principles of Landscape Ecology“** • Basic concepts of Landscape Ecology • reductionism and emergence / holism and atomism • hierarchy and landscape units • The ecosystem concept • Stability and Resilience concepts • Self-organization and self-regulation • Evolution and dynamics of landscapes in space and time • Landscape in land use conflicts **Lecture „Nature Conservation Economics“** • economy and the living environment • Global nature- and biodiversity conservation strategies • markets and government intervention in nature- and landscape protection • Public goods, common goods and natural resource management • economics of conservation and genetic diversity • Economics of protected areas • Economic principles for the valuation of goods and services • agriculture, forestry and nature conservation • Tourism, Recreation and Conservation • Payments for ecosystem services • compensatory measures and tradable rights • Costs and benefits of Natura 2000 • economy of community-based conservation • nature conservation in developing countries				
Courses	6 ETCS are to be acquired	SWS	Contact time (in h)	Self study	Total workload
	Principles of Landscape Ecology (V)	2	30	120	180
	Nature Conservation Economics (V)	2	30		
Assessment	1 oral exam (25 minutes) to the contents of the module				
Frequency	Annually, Winter semester				
Duration	1 Semester				
Prerequisites					
Recommended semester	1. Semester				
Previous knowledge	economic and ecological basic knowledge				

Basic Module B2: Ethics and Environment

Module responsibility	Leiter AG Umweltethik
Language	English, German
Learning outcomes	• Knowledge of global ecological relationships and the ability to assess their human influence generally comprehensible • Familiarity with the terms, conditions, methods and various concepts of environmental ethics • In-depth insight into the concept of a holistic environmental ethics • Competence for independent ethical reasoning in different nature conservation contexts •
Module content	**Lecture „Global Environmental Problems“** • Special features of the planet Earth, basic stages of geological history and evolution • the global carbon cycle, the roles of atmosphere, surface and deep ocean, the land biomass, soils and human intervention • global water cycle and its influence by humans • the global N- and P-cycle in comparison • Energy budget and global climate • climate change - natural variability and human impact, ecological effects • Economics of Climate Change • Alternative Energy and Alternative concept of Land Use **Lecture „Naturethik“ (wo) / Seminar „Nature ethics“ (wo)** • emergence of environmental ethics, their fundamental role in assessing and dealing with environmental problems • self-concept and methodology • Nature of Philosophy, anthropological and epistemological conditions • Conceptual basics • overview of the basic types of environmental ethics • anthropocentrism, the concept of sustainability, climate ethics • Non-anthropocentric approaches • The concept of holistic environmental ethics: Justification, consequences, trade-offs, balancing criteria • limits of ethical systematization

Courses	6 ETCS are to be acquired	SWS	Contact time (in h)	Self study	Total workload
	Global Environmental Problems (V)	2	30	120	180
	Naturethik (V) (wo)	2	30		
	Nature ethics (S) (wo)	2	30		

Assessment	Written exam (90 Minutes) to the contents of the module
Frequency	Annually, winter semester + summer semester
Duration	2 Semester
Prerequisites	-
Recommended semester	1. & 2. Semester

Previous knowledge	Lecture „Theorie und Geschichte der Ökologie” (Winter semester)

Basic Module B3: International Excursion					
Module responsibility	Head of working group Mire Studies and Palaeoecology				
Language	English, German				
Learning outcomes	• The students have traveled to a natural and cultural region outside of Germany and learned about the typical vegetation structures and resource management performed in the visited region and built an understanding of its nature conservation status and problems.				
Module content	**Excursion “International Excursion”** • Field trip to a region in a country other than Germany • Introduction to biodiversity and natural areas of the visited location • Introduction on the nature conservation problems of the visited location				
Courses	6 ETCS are to be acquired	SWS	Contact time (in h)	Self study	Total workload
	International Excursion (E)	5	75	105	180
Assessment	1 written report (10 pages) or one oral presentation (20 minutes)				
Frequency	Annually				
Duration	1 Semester				
Prerequisites	None				
Recommended semester	2. Semester				
Previous knowledge	None				

Basic Module B4: Research Internship					
Module responsibility	Chairman of the examination board				
Language	English, German				
Learning outcomes	• Extended theoretical and practical knowledge related to the concrete research question the student is involved at the internship • Extended knowledge and abilities regarding independent scientific work and production of scientific texts				
Module content	• Development of an experimental design to address the posed research question • In-depth introduction to the assessment of scientific literature • Independent conduction of a concrete research project • Assessment, presentation and discussion of results in a written report				
Courses	8 ETCS are to be acquired	SWS	Contact time (in h)	Self study	Total workload
	Research Internship	7		240	240
Assessment	1 written report (10 pages)				

Frequency	In agreement with internship supervisor
Duration	1 Semester
Prerequisites	None
Recommended semester	3. Semester
Previous knowledge	None

Basic Module B5: Personal Profiling					
Module responsibility	Chairman of the examination board				
Language	English, German				
Learning outcomes	Building of additional qualifications and competences that are closely related to the program coursework and enhance the personal profile of the student, in relation to his future employability in academy, non-governmental organisations, private industry and public service				
Module content	• Content according to the student's respective choice. The 4 ECTS points for the module can be freely chosen from the complete course catalog at the Ernst-Moritz-Arndt University Greifswald. This as long as the chosen course has not been completed during previous studies • It is recommended to select courses that improve the student's personal employability perspectives, for instance course work from the fields of statistics, retoric and oral expression, presentation methodologies, law, economy, educational theory, sustainability, etc				
Courses	4 ETCS are to be acquired	SWS	Contact time (in h)	Self study	Total workload
	4 ECTS to be self chosen				120
Assessment	1 written report (10 pages)				
Frequency	Annually				
Duration	1 Semester				
Prerequisites	None				
Recommended semester	3. Semester				
Previous knowledge	None				

Elective Module E3: Cost Benefit Analysis	
Module responsibility	Head of working group Landscape Economy
Language	English
Learning outcomes	The students will develop and improve their knowledge of microeconomy regarding the economic valuation of natural and landscape resources, as well as the evaluation of all sorts of interventions to the environment. They are able to effectively apply the Cost-Benefit Analysis approach to different situations
Module content	**Lecture "Cost-Benefit Analysis"**

<table>
<tr><td></td><td colspan="5">

Introduction to the theoretical foundations of Cost-Benefit Analysis and to its practical applications
Microeconomical principles of the wellfare economy (consumer and producer surplus, compensating and equivalent variation, willingness to pay and willingness to accept)
Valuation of costs and benefits in primary and secundary markets, total economic value of natural resources
Discounting of future costs and benefits, private and social discount rates
Uncertainty, Expectation values, information and quasi option values
Evaluation methods (project demonstration, direct market value, indirect market value, production value, contingent evaluation, choice experiments)
Benefit transfer and shadow price
Steps in a Cost-Benefit Analysis and case studies
Alternative evaluation methods (Cost-Effectiveness Analysis, Multiple Criteria Analysis)

Practical “Cost-Benefit Analysis”

Practical application of Cost-Benefit analysis on selected case studies
Sample calculations
Applications of table calculations
Applications of statistical methods

</td></tr>
<tr><td rowspan="3">Courses</td><td>6 ETCS are to be acquired</td><td>SWS</td><td>Contact time (in h)</td><td>Self study</td><td>Total workload</td></tr>
<tr><td>Cost-Benefit Analysis (V)</td><td>2</td><td>30</td><td rowspan="2">120</td><td rowspan="2">180</td></tr>
<tr><td>Cost-Benefit Analysis (Ü)</td><td>2</td><td>30</td></tr>
<tr><td>Assessment</td><td colspan="5">Written exam (90 minutes) about the lecture</td></tr>
<tr><td>Frequency</td><td colspan="5">Annually, Summer semester</td></tr>
<tr><td>Duration</td><td colspan="5">1 Semester</td></tr>
<tr><td>Prerequisites</td><td colspan="5">None</td></tr>
<tr><td>Recommended semester</td><td colspan="5">2. Semester</td></tr>
<tr><td>Previous knowledge</td><td colspan="5">Conservation Economy, Environmental Economy</td></tr>
</table>

Elective Module E4: Economic Valuation of Natural Resources	
Module responsibility	Head of working group Landscape Economy
Language	English
Learning outcomes	Students apply their economic knowledge from the module "Cost Benefit Analysis" in the context of a literature review and an evaluation project. They are able to deal critically with literature and have security in presentation style and writing skills. They can design and execute research projects as part of the economic evaluation of natural resources.
Module content	**Seminar „ Economic valuation of natural resources“** • Presentation and discussion of scientific texts to the project theme

<table>
<tr><td></td><td colspan="5">• Preparation and supporting of the processing of the project for economic evaluation
Project work
• Processing a scientific issue within a practical assessment project, including written report</td></tr>
<tr><td rowspan="3">Courses</td><td>6 ETCS are to be acquired</td><td>SWS</td><td>Contact time (in h)</td><td>Self study</td><td>Total workload</td></tr>
<tr><td>Valuation of natural resources (S)</td><td>2</td><td>30</td><td rowspan="2">120</td><td rowspan="2">180</td></tr>
<tr><td>Project work (P)</td><td>2</td><td>30</td></tr>
<tr><td>Assessment</td><td colspan="5">seminar paper (25 Pages) to the course „Project work“</td></tr>
<tr><td>Frequency</td><td colspan="5">Annually, winter semester</td></tr>
<tr><td>Duration</td><td colspan="5">1 Semester</td></tr>
<tr><td>Prerequisites</td><td colspan="5">Complete the course"Cost Benefit Analysis" with a passing grade, Limited number of participants, participation only with the permission of the module coordinator</td></tr>
<tr><td>Recommended semester</td><td colspan="5">3. Semester</td></tr>
<tr><td>Previous knowledge</td><td colspan="5">Conservation Economy, Environmental Economy, Cost Benefit Analysis</td></tr>
</table>

Elective Module E5: Peatland Utilisation	
Module responsibility	Head of working group Mire Studies and Paleoecology
Language	English
Learning outcomes	• Knowledge about different mire uses and their consequences for the environment and ecology, potential conflicts and compromise possibilities • Capacity to analyse and evaluate the use of mires and its alternatives • Extended knowledge about sustainability and “wise use” of mires • Skills in conflict resolution between mire use and conservation interests
Module content	• Ecosystem services • Production functions: Peat, rinking water, wild plants and animals • Transfer functions: Hydroelectricity, water storage, fisheries, urban development, infrastructure, military training areas • Regulation functions in relation to climate, hydrology, water treatment, soil erosion • Information functions in relation to identity and continuity, social contact and labor, leisure and relaxation, beauty, symbolism, evolutionary and ecological relatedness, paleo and modern ecological information, self-organisation and regulation • Transformation and option functions: Education • “Wise use” of mires: Principles, analysis of conflicts, limits, guidelines • Commoditization of ecosystem services • Mire, climate and greenhouse gases • UNFCCC, Kyoto Protocol, REDD+, IPCC reporting

<table>
<tr><td></td><td colspan="5">• Standards, criteria and certifications
• Verified Carbon Standard (VCS): Practical example
• Carbon and co-benefits: MoorFutures 2.0
• Economical aspects of carbon bonds
• Ethic and indulgence</td></tr>
<tr><td rowspan="3">Courses</td><td>6 ETCS are to be acquired</td><td>SWS</td><td>Contact time (in h)</td><td>Self study</td><td>Total workload</td></tr>
<tr><td>Peatland utilisation (V)</td><td>2</td><td>30</td><td rowspan="2">120</td><td rowspan="2">180</td></tr>
<tr><td>Carbon credits from peatland rewetting (V/S)</td><td>2</td><td>30</td></tr>
<tr><td>Assessment</td><td colspan="5">Written exam (60 minutes) about the lecture „Peatland utilisation“ and confirmation of participation („Carbon credits from peatland rewetting“)</td></tr>
<tr><td>Frequency</td><td colspan="5">Biannually, Semester break</td></tr>
<tr><td>Duration</td><td colspan="5">2 Semester</td></tr>
<tr><td>Prerequisites</td><td colspan="5">None</td></tr>
<tr><td>Recommended semester</td><td colspan="5">1. - 3. Semester</td></tr>
<tr><td>Previous knowledge</td><td colspan="5">None</td></tr>
</table>

<table>
<tr><th colspan="6">Elective Module E8: Botanical Species Conservation 1 (Plant Species Conservation)</th></tr>
<tr><td>Module responsibility</td><td colspan="5">Head of working group General and Special Botany</td></tr>
<tr><td>Language</td><td colspan="5">English</td></tr>
<tr><td>Learning outcomes</td><td colspan="5">• Advanced knowledge in the topic of botanical species conservation
• Knowledge about important tools for plant species conservation
• Interpretation and principles of the ellaboration species red lists, priority assignment of conservation measures
• Strategies for the determination of the biological basis in recovery programs for selected plant species</td></tr>
<tr><td>Module content</td><td colspan="5">• Changes in vegetation communities and extintions in Germany and other regions of the world
• Risk sources for Central European Flora
• Red List in Germany and the IUCN: Structure, Categories, Criteria
• Priority assignment in species conservation
• Determination and data acquisition for life cycle, dispersal and reproductive systems of plants for their use in species protection programs
• Scientific projects on species protection and species protection programs</td></tr>
<tr><td rowspan="3">Courses</td><td>6 ETCS are to be acquired</td><td>SWS</td><td>Contact time (in h)</td><td>Self study</td><td>Total workload</td></tr>
<tr><td>Plant Species Conservation (V)</td><td>2</td><td>30</td><td rowspan="2">120</td><td rowspan="2">180</td></tr>
<tr><td>Investigatoin of autecological data in plants (S)</td><td>2</td><td>30</td></tr>
</table>

Assessment	Oral presentation (20 minutes) in the seminar
Frequency	Biannually alternating with the modules “Conservation Genetics of Plants” 1 and 2, Summer semester
Duration	1 Semester
Prerequisites	Limited number of participants, participation only with permission of the module coordinator
Recommended semester	2.- Semester
Previous knowledge	General Botany, Population Biology

Elective Module E9: Botanical Species Conservation 2 (Plant Species Conservation)

Module responsibility	Head of working group General and Special Botany				
Language	English				
Learning outcomes	• Knowledge of plant population biology principles and models • Comprehension and development of simple population biology models • Practical knowledge on the acquisition and generation of population biology and demographic data for plant populations				
Module content	• Principles of Population Biology • Models in Population Biology (based on populations and individuals, demographic matrices) • Practical exercises about the determination of population biology characteristics of selected plant populations				
Courses	6 ETCS are to be acquired	SWS	Contact time (in h)	Self study	Total workload
	Plant Population Biology (V)	2	30	120	180
	Field experiments in Plant Population Biology (P)	2	30		
Assessment	Written protocol (10 pages) in the practical exercise				
Frequency	Biannually alternating with the modules “Conservation Genetics of Plants” 1 and 2, Summer semester				
Duration	1 Semester				
Prerequisites	Limited number of participants, participation only with permission of the module coordinator, at the same time or after succesfully completing the module “Botanical Species Conservationi 1” (E8)				
Recommended semester	2.- Semester				
Previous knowledge	General botany, Botanical species conservation				

Elective Module E10: Conservation Genetics of Plants 1 (Reproductive Biology)

Module responsibility	Head of working group General and Special Botany

Language	English				
Learning outcomes	• Knowledge on the evolution and ocurrence of different reproductive systems in plant • Evolution of sexual reproduction and its interplay with vegetative reproduction in higher plants • Knowledge on the role of reproductive systems in speciation processes • Experimental approach to determine reproductive systems and sex ratios in higher plants • Basic knowledge about the application of molecular methods in genotyping and population genetics, interpretation of results				
Module content	• Evolution of sexual reproduction, Advantages and disadvantages compared to vegetative reproduction • Mating types and sexes, alternation of generations • Evolution of monoecy and dioecy, sex ratios in plants and causes of ratio shifts • Gynodioecy and cytoplasmic male sterility • Influence of polyploidy on the evolution of reproductive systems • Apomixis: Causes and consequences for the speciation process • Sequencing and fragment-oriented molecular methods in population genetics				
Courses	6 ETCS are to be acquired	SWS	Contact time (in h)	Self study	Total workload
	Plant Breeding Systems (V)	2	30	120	180
	Molecular Methods in Population Genetics and Plant Systematics (S)	2	30		
Assessment	Oral presentation (20 minutes) in the seminar				
Frequency	Biannually alternating with the modules “Botanical Species Conservation” 1 and 2, Summer semester				
Duration	1 Semester				
Prerequisites	Limited number of participants, participation only with permission of the module coordinator				
Recommended semester	2.- Semester				
Previous knowledge	General botany, Principles of Population Genetics				

Elective Module E11: Conservation Genetics of Plants 2 (Population Genetics)	
Module responsibility	Head of working group General and Special Botany
Language	English
Learning outcomes	• Knowledge about population genetics and its application to lower and higher plant studies • Application of molecular biology laboratory methods in population genetics research questions • Evaluation of results (primary data) of sequencing or fragment-length analysis for genotyping or derivation of population genetics

	parameters				
Module content	• Heredity of different sections in the genome • Hardy-Weinberg equilibrium in different plant reproductive systems • Neutral and adaptive (under selection pressure) markers • Gene flow and genetic drift • F-Statistic and population fragmentation • Laboratory practice on the application of molecular biology methods (DNA extraction, sequencing or finger printing method)				
Courses	6 ETCS are to be acquired	SWS	Contact time (in h)	Self study	Total workload
	Plant Population Genetics (V)	2	30	120	180
	Molecular Methods in Plant Population Genetics (P)	2	30		
Assessment	Written report (10 pages) in the practical exercise				
Frequency	Biannually alternating with the modules “Botanical Species Conservation” 1 and 2, Summer semester				
Duration	1 Semester				
Prerequisites	Limited number of participants, participation only with permission of the module coordinator, at the same time or after succesfully completing the module “Conservation Genetics of Plants 1” (E10)				
Recommended semester	2. Semester				
Previous knowledge	General botany, Principles of Plant Reproductive Biology				

Elective Module E12: Experimental Plant Ecology 1					
Module responsibility	Head of working group Experimental Plant Ecology				
Language	English				
Learning outcomes	• Advanced knowledge in plant ecology and it’s up to date research questions. • Development of experimental designs and statistical analyses.				
Module content	• Experimental designs such as blocked designs, split plot designs, Coordinated Distributed Experiments, gradient experiments. • ANOVA and regression analyses in linear and mixed models. • Structured literature search. • Gaps of knowledge and current developments in plant ecology. • Developing and presenting summaries of state of the art for specific research questions.				
Courses	6 ETCS are to be acquired	SWS	Contact time (in h)	Self study	Total workload
	Experimental Design & Analysis (V)	2	30	120	180
	Frontiers in Plant Ecology (S)	2	30		
Assessment	1 presentation in the seminar				
Frequency	Annually, winter semester				
Duration	1 Semester				
Prerequisites	Limited number of participants, Participation only with the permission of				

	the module coordinator
Recommended semester	1.-3. Semester
Previous knowledge	Basic knowledge in statistics, R and plant ecology

Elective Module E13: Experimental Plant Ecology 2					
Module responsibility	Head of working group Experimental Plant Ecology				
Language	English				
Learning outcomes	• Development of experimental designs and statistical analyses. • Scientific writing.				
Module content	• Designing, setting up, maintaining, and sampling data in controlled experiments. • Analysis and interpretation of experimental results. • Writing a scientific report (Intro-Methods-Results-Discussion-Conclusions-References)				
Courses	6 ETCS are to be acquired	SWS	Contact - time (in h)	Self study	Total workload
	Exercise Ecological Experiments (in groups) (Ü)	3	45	105	180
	Seminar Ecological Experiments (S)	2	30		
Assessment	1 scientific report (10 pages)				
Frequency	annually, winter semester				
Duration	1 Semester				
Prerequisites	Limited number of participants, Participation only with the permission of the module coordinator				
Recommended semester	1.-3. Semester				
Previous knowledge	Basic knowledge in statistics, R and plant ecology				

Elective Module E14: Ornithology 1	
Module responsibility	Head of working group Ornithology
Language	English
Learning outcomes	• Knowledge about ornithology as a scientific discipline through the understanding of avian characteristics, their ecology and evolution • Introduction to current methods in Ornithology • Understanding the role of birds in different habitats and their relation to humans
Module content	• Introducton to Ornithology, hisitory, definitions and main concepts • Origin and evolution of birds, evolution of flight • Special anatomical and physiological adaptations • Reproduction, growth and development • Breeding behaviour, mating systems • Social systems, territoriality

<table>
<tr><td></td><td colspan="5">• Foraging, adaptation to different habitat types
• Sexual selection, feathers and colors
• Further ways to communicate and explore the environment vocalization
• Circadian and circannual cycles
• Migraton and navigation
• Systematic and phylogeny, current hypothesis and methods
• Diversity and biogeography, humans and birds
• Management and conservation, case studies

Seminar “Ornithology” (in English)
• Individual preparation and presentation of selected topics in Ornithology</td></tr>
<tr><td rowspan="3">Courses</td><td>6 ETCS are to be acquired</td><td>SWS</td><td>Contact time (in h)</td><td>Self study</td><td>Total workload</td></tr>
<tr><td>Ornithology (V)</td><td>2</td><td>30</td><td rowspan="2">120</td><td rowspan="2">180</td></tr>
<tr><td>Ornithology (P)</td><td>2</td><td>30</td></tr>
<tr><td>Assessment</td><td colspan="5">Written exam (60 minutes) about the contents of the lecture; presentation (20 Minutes) in the seminar</td></tr>
<tr><td>Frequency</td><td colspan="5">Annual, Summer semester</td></tr>
<tr><td>Duration</td><td colspan="5">1 Semester</td></tr>
<tr><td>Prerequisites</td><td colspan="5">Limited number of participants, participation only with permission of the module coordinator</td></tr>
<tr><td>Recommended semester</td><td colspan="5">2. Semester</td></tr>
<tr><td>Previous knowledge</td><td colspan="5">(V) Ecology, (V) Evolution and Phylogeny</td></tr>
</table>

<table>
<tr><th colspan="6">Elective Module E15: Ornithology 2</th></tr>
<tr><td>Module responsibility</td><td colspan="5">Head of working group Ornithology</td></tr>
<tr><td>Language</td><td colspan="5">English</td></tr>
<tr><td>Learning outcomes</td><td colspan="5">• Identification of local bird species in the collection and field
• Proficiency in current methods in ornithology
• Understanding of the role of birds in different habitats and their relation to humans</td></tr>
<tr><td>Module content</td><td colspan="5">Practical exercise “In-depth ornitological methods”
Introduction to field ornithology and presentation of methods for the study of birds on field sites. For example: identification of birds based on skin and feathers and on the field, observations, bird counts, mapping, morphological measurements, use of sonograms, telemetry, habitat characterization</td></tr>
<tr><td rowspan="3">Courses</td><td>6 ETCS are to be acquired</td><td>SWS</td><td>Contact time (in h)</td><td>Self study</td><td>Total workload</td></tr>
<tr><td rowspan="2">In-depth ornithological methods (Ü)</td><td rowspan="2">4</td><td>30</td><td rowspan="2">120</td><td rowspan="2">180</td></tr>
<tr><td>30</td></tr>
<tr><td>Assessment</td><td colspan="5">Written report (10 pages) about the practical exercise</td></tr>
</table>

Frequency	Annual, Summer semester
Duration	1 Semester
Prerequisites	Limited number of participants, participation only with permission of the module coordinator, at the same time or after succesfully completing the module “Ornithology 1” (E14)
Recommended semester	From 3. Semester on
Previous knowledge	(V) Ecology, (V) Evolution and Phylogeny

Elective Module E16: Animal Conservation & Ecology 1					
Module responsibility	Head of Department of Animal Ecology				
Language	English				
Learning outcomes	• Competent theoretical knowledge in animal conservation biology • Critical reflection of up-to-date scientific papers of relevance to nature conservation				
Module content	**Lecture „Animal Conservation and Ecology“** • Introduction into conservation biology • Factors affecting biodiversity • Habitat degradation, loss and fragmentation • Overexploitation • Invasive species • Biological responses to climate change • Conservation genetics • Species and landscape approaches to conservation • Aims, limits and design of nature reserves • corridors in conservation biology **Seminar „Animal Conservation“** • Self-dependent preparation and presentation of topics relating to the protection and management of endangered species				
Courses	6 ETCS are to be acquired	SWS	Contact-time (in h)	Self study	Total workload
	Animal Conservation and Ecology (V)	2	30	120	180
	Animal Conservation (S)	2	30		
Assessment	Written exam (60 minutes) on the contents of the lecture; seminar talk* (20 minutes) in the seminar				
Frequency	yearly, summer term				
Duration	1 semester				
Prerequisites	Restricted number of participants, participation only possible with permission of the module lecturer				
Recommended semester	2. semester				
Previous knowledge	Basic knowledge in animal ecology				

Elective Module E17: Animal Conservation & Ecology 2					
Module responsibility	Head of Department of Animal Ecology				
Language	English				
Learning outcomes	• Understanding of practical issues in conservation biology • Knowledge in data analysis and scientific writing				
Module content	• Design and execution of a field study relating to nature conservation • Analysis and presentation (scientific paper) of the results obtained				
Courses	6 ETCS are to be acquired	SWS	Contact-time (in h)	Self-study	Total workload
	Animal Conservation (E)	5	75	105	180
Assessment	Scientific report (10 pages)				
Frequency	yearly, summer term				
Duration	1 semester				
Prerequisites	Restricted number of participants, participation only possible with permission of the module lecturer; participation is possible in combination with module E16				
Recommended semester	2. semester				
Previous knowledge	Basic knowledge in animal ecology				

Elective module E18: Vegetation Ecology 1					
Module responsibility	Members of the working group Landscape Ecology and Ecosystem Dynamics				
Language	English				
Learning outcomes	• Students are able to analyse relationships between vegetation and environmental drivers and to interprete these relationships by means of advanced aut- and synecological knowledge				
Module content	**lecture/exercise Quantitative Methods in Community Ecology** ▪ Basic knowledge about the statistical environment R ▪ Data types, data skaling, data transformation and standardisation ▪ correlation- and regression techniques, distance measures ▪ Multivariate ordination and classification techniques **Seminar Vegetation Ecology** • Presentation and discussion of morn hypotheses, theories and concepts in plant and vegetation ecology				
Courses	6 ECTS are to be acquired	SWS	Contact time (in h)	Self studies	Total workload
	Quantitative Methods in Community Ecology (V/Ü)	3	45	105	180
	Seminar Vegetation Ecology (S)	2	30		
Assessment	Exercise works (20 pages) in Quantitative methods in community ecology, oral presentation* (20 minutes) in the Seminar				
Frequency	Annually, winter semester				

Duration	1 semester
Prerequisites	Restricted participation capacity, participation only with permission of the module leader
Recommended semester	1st or 3st semester
Previous knowledge	Basic knowledge in statistics and R

Elective module E19: Vegetation Ecology 2					
Module responsibility	Members of the working group Landscape Ecology and Ecosystem Dynamics				
Language	English				
Learning outcomes	• in-depth-knowledge of the basic landscape-ecological components (climate, relief, soil, water, vegetation, mankind) of the Central-European landscape in space and time at an example case • practical knowledge of collecting data in field and preparation of scientific data • knowledge and practical skills for quantitative analysis of plant communities • in-depth-knowledge of presentation and discussion of current topics of vegetation ecology				
Module content	• Development of a question in vegetation ecology • vegetation-ecological gradient analysis • lab analysis of biomass and site parameters • Data preparation and quantitative-statistical data analysis				
Courses	6 ETCS are to be acquired	SWS	Contact-time (in h)	Self - study	Total workload
	Case Study Vegetation Ecology (P)	5	75	105	180
Assessment	Scientific report (WB) (10 Pages)				
Frequency	Annually, summer term				
Duration	1 semester				
Prerequisites	Limited number of participants, Participation only with the permission of the module coordinator				
Recommended semester	2.Semester				
Previous knowledge	Optional module Vegetation Ecology 1, Species knowledge of central European plants, basic knowledge of statistics & R				

Elective Module E20: General and Applied Aquatic Ecology	
Module responsibility	Director of Biological Station of Hiddensee
Language	English
Learning outcomes	• Advanced knowledge in aquatic ecology • Critical discussion and presentation of current scientific papers in aquatic ecology
Module content	• Different types of aquatic ecosystems • Physical-chemical parameters in aquatic ecosystems • Organism groups in aquatic ecosystems

	• Impact of eutrophication on abiotic / biotic parameters • Impact of acidification on abiotic / biotic parameters • Indicator organisms • Trophic interactions in aquatic ecosystems • Scientific papers on current research topics in aquatic ecology				
Courses	6 ETCS are to be acquired	SWS	Contact - time (in h)	Self - study	Total workload
	Aquatic Ecology – general and applied aspects (V)	2	30	120	180
	Aquatic Ecology – organisms and trophic interactions (V)	1	15		
	Seminar Aquatic Ecology (S)	1	15		
Assessment	Written exam (90 Minutes) about the contents of the lectures; Presentation * (20 Minutes) in Seminar				
Frequency	annually, Winter semester				
Duration	1 Semester				
Prerequisites	Limited number of participants, Participation only with the permission of the module coordinator				
Recommended semester	1. or 3. semester				
Previous knowledge	None				

Elective Module E21: Aquatic Ecology – Summer course					
Module responsibility	Director of Biological Station of Hiddensee				
Language	English				
Learning outcomes	• Advanced knowledge in aquatic ecology • Practical skills: investigations in aquatic ecology • Teamwork skills (“peer learning”). Group discussions, written presentations				
Module content	• Investigations of different types of aquatic ecosystems • Measurements of physical-chemical parameters in aquatic ecosystems • Characterization of different organism groups in aquatic ecosystems • Investigations of anthropogenic impacts on aquatic ecosystems • Investigations of trophic interactions in aquatic ecosystems • Data analysis and presentation				
Courses	6 ETCS are to be acquired	SWS	Contact - time (in h)	Self - study	Total workload
	Aquatic Ecology – Field course including seminar	5	60	120	180
Assessment	Presentation* (20 Minutes) und group protocol (10 Pages)				
Frequency	annually, Summer semester				
Duration	1 Semester				

Prerequisites	Limited number of participants, Participation only with the permission of the module coordinator
Recommended semester	2. Semester
Previous knowledge	Module General and Applied Aquatic Ecology

Elective Module E22: Conservation and Behaviour 1					
Module responsibility	Head of working group Applied Zoology and Nature Conservation				
Language	English/German				
Learning outcomes	The students are learning interdisciplinary approaches in conservation biology. The overarching goal is to achieve a comprehensive understanding how basic science and nature conservation complement each other in conservation biology.				
Module content	**Lecture „Conservation & Behaviour“** Fundamental topics in behavioural ecology and their application in conservation biology. ▪ Foraging behaviour and conservation ▪ Anti-predator behaviour and conservation ▪ Habitat selection, dispersal and conservation ▪ Sexual selection, mate choice and conservation ▪ Mating systems and conservation ▪ Parental investment and conservation ▪ Sociobiology and conservation ▪ Cooperative behaviour and conservation ▪ Animal personalities and conservation ▪ Human behaviour and conservation **Seminar „Frontiers in Conservation“ („wo“)** ▪ We discuss controversial questions in conservation biology at the interface with evolutionary biology and read and present literature published in English in international journals or in recent books. ▪ The topics covered complement the lecture **Seminar „Conservation Behaviour“ („wo“)** ▪ We discuss controversial questions in conservation biology at the interface with behavioural ecology and read and present literature published in English in international journals or in recent books. ▪ The topics covered complement the lecture				
Courses	6 ETCS are to be acquired	SWS	Contact - time (in h)	Self - study	Total workload
	Naturschutz und Verhalten (V)	2	30	120	180
	Seminar „Frontiers in Conservation“ (S, wo) **or** Seminar „Conservation Behaviour“ (S, wo)	2	30		
Assessment	Written exams (60 Minutes) about the lecture, Presentation* (20 Minutes) in the chosen Seminar				
Frequency	annually, Summer semester				

Duration	1 Semester
Prerequisites	Limited number of participants, Participation only with the permission of the module coordinator; English skills
Recommended semester	2. Semester
Previous knowledge	Combination with the module Conservation and Behavior 2 is recommended, but not required

Elective Module E23: Conservation and Behaviour 2					
Module responsibility	Head of working group Applied Zoology and Nature Conservation				
Language	English/German				
Learning outcomes	The theoretical knowledge obtained in the Module Conservation and Behaviour 1 will be used during practical research at the interface of conservation and behavioural ecology.				
Module content	**Practical „Behavioural Methods in Conservation“** Data collection in the field or lab at the interface of conservation biology and behavioural ecology. Focus is on studies on bats.				
Courses	6 ETCS are to be acquired	SWS	Contact - time (in h)	Self - study	Total workload
	Behavioural Methods in Conservation (Ü)	4	60	120	180
Assessment	Protocol (10 Pages) or poster presentation				
Frequency	annually, Summer semester				
Duration	1 Semester				
Prerequisites	Limited number of participants, Participation only with the permission of the module coordinator; English skills; only simultaneously or after completion of the module Conservation and Behaviour 1				
Recommended semester	2. Semester				
Previous knowledge					

Elective Module E24: Conservation Genetics 1	
Module responsibility	Head of working group Applied Zoology and Nature Conservation
Language	English
Learning outcomes	Students will learn the principles of genetics and techniques/tools used to study various aspects of populations/species, including behaviour, ecology and evolution, information that are important for the protection of species and their management. The course will detail the strength but also the limits of different genetic methods, with particular attention paid to adapting the techniques/tools to the questions being addressed. The course will be focused on conservation hence will include numerous case study examples across animals and plants.
Module content	**Lecture „Conservation and Landscape Genetics“** ▪ Genetics and extinction ▪ Genetic diversity: definitions, detection methods ▪ Maintenance of genetic diversity ▪ Inbreeding, demographics, genetic rescue and extinction ▪ Landscape genetics & dispersion ▪ Population fragmentation, differentiation & assignment methods

<table>
<tr><td></td><td colspan="5">▪ Non-invasive genetics in conservation
▪ Evolutionary genetics of natural populations
▪ Molecular phylogenetics
▪ Wildlife diseases
▪ Wildlife forensics
▪ Invasive species
Seminar „Evolutionary Conservation Biology“ („wo“)
▪ Presentation and discussion of primary literature published in international journals or in recent books in relation to the emergence of new fields of research within conservation genetic and controversies in conservation genetics.
Seminar „Current Topics in Conservation“(„wo“)
▪ We discuss controversial questions in conservation biology with a focus on behavioural ecology and read and present primary literature published in international journals or in recent books.
▪</td></tr>
<tr><td rowspan="3">Courses</td><td>6 ETCS are to be acquired</td><td>SWS</td><td>Contact - time (in h)</td><td>Self - study</td><td>Total workload</td></tr>
<tr><td>Conservation and Landscape Genetics (V)</td><td>2</td><td>30</td><td rowspan="2">120</td><td rowspan="2">180</td></tr>
<tr><td>Seminar „Current topics in Conservation“ (S, wo)

or
Seminar “Evolutionary Conservation Biology” (S, wo)</td><td>2</td><td>30</td></tr>
<tr><td>Assessment</td><td colspan="5">Written exams (60 Minutes) about the lecture, Presentation* (20 Minutes) in chosen seminar</td></tr>
<tr><td>Frequency</td><td colspan="5">annually, Winter semester</td></tr>
<tr><td>Duration</td><td colspan="5">1 Semester</td></tr>
<tr><td>Prerequisites</td><td colspan="5">Limited number of participants, Participation only with the permission of the module coordinator; English skills</td></tr>
<tr><td>Recommended semester</td><td colspan="5">1. or 3. Semester</td></tr>
<tr><td>Previous knowledge</td><td colspan="5">combination with the module Conservation Genetics 2 is recommendable, but not a requirement</td></tr>
</table>

Elective Module E25: Conservation Genetics 2	
Module responsibility	Head of working group Applied Zoology and Nature Conservation
Language	English
Learning outcomes	The knowledge obtained during the module Conservation Genetics 1 will be used in the present module to analyze real datasets and answer specific conservation questions that managers/conservationists are regularly faced with. The module is computer based and includes hand-on the most commonly used population genetic programs. How to use the programs will be demonstrated during the module hence no prior knowledge of these programs is required for this module. The end goal is to be able to analyze a dataset, interpret the results and answer the original question.
Module content	**Exercise „Methods in Conservation and Landscape Genetics“:**

	▪ Analysis will include among others: ▪ -Data formatting, checking and manipulation, ▪ -Tests for population differentiation ▪ -Analysis of population structure via complementary methods ▪ -Landscape genetic analyses ▪ -Analysis of sequences data for phylogeography				
Courses	6 ETCS are to be acquired	SWS	Contact-time (in h)	Self - study	Total workload
	Methods in Conservation and Landscape Genetics (Ü)	4	60	120	180
Assessment	Protocol (10 Pages)				
Frequency	annually, Winter semester				
Duration	1 Semester				
Prerequisites	Limited number of participants, Participation only with the permission of the module coordinator; English skills; only simultaneously with or after completion of elective module Conservation Genetics 1 (E24)				
Recommended semester	1. or 3. Semester				
Previous knowledge					

Elective Module E30: Biology of Reproduction in Animals 1 (Behaviour, Mechanisms & Strategies)					
Module responsibility	Head of working group General and Systematic Zoology				
Language	English				
Learning outcomes	• In-depth knowledge about reproduction biology, comparative and theoritical aspects • Critical reflexion on current scientific studies on the realm of behavioural ecology and functional morphology • Ellaboration of group presentations • Skills on the inspection and analysis of genital structures of invertebrates and conclusions on reproductive strategies				
Module content	• Scientific principles of reproduction biology • Sexual selection and conflict • Mating systems • “Anatomy of fitness”: Introduction to the preparation, histology and electron-transmisson microscopy of genital structures • Scientific article about behavioural ecology and functional morphology topics in the context of sexual selection				
Courses	6 ETCS are to be acquired	SWS	Contact time (in h)	Self study	Total workload
	Reproduction biology in animals (V)	2	30	105	180
	Reproduction biology in animals (S)	1	15		
	Anatomy of fitness (Ü)	2	30		
Assessment	Written exam (60 minutes) about the content of the lecture and the practical exercise, oral presentation (20 minutes) in the seminar				
Frequency	Annual, Summer semester				

Duration	1 Semester
Prerequisites	Limited number of participants, participation only with permission of the module coordinator
Recommended semester	2. Semester
Previous knowledge	Basic knowledge of Evolutionary Biology Good knowledge of the English language

Elective Module E31: Biology of Reproduction in Animals 2 (Behavioural Ecology)

Module responsibility	Head of working group General and Systematic Zoology				
Language	English				
Learning outcomes	• Advanced knowledge about behavioural data acquisition and analysis • Critical reflexion on current scientific studies in the realm of behavioural ecology and functional morphology • Skills on the ellaboration and presentation of group results • Skills on the application of statistical methods				
Module content	• Methods of behavioural research • Project about behavioural ecology or functional morphology of reproductive organs				
Courses	6 ETCS are to be acquired	SWS	Contact time (in h)	Self study	Total workload
	Analysis of behaviour (Ü)	2	30	105	180
	Reproduction biology in animals (Ü)	3	45		
Assessment	Written report (10 pages) about the practical exercise				
Frequency	Annual, Summer semester Alternatively the practical exercise can be performed as part of the “International Advanced Behavioural Ecology Field Courses” where projects are carried out together with students from other Universities				
Duration	1 Semester				
Prerequisites	Only At the same time or after succesful conclusion and participation in the course “Boilogy of Reproduction in Animals 1” (E30) Limited number of participants, participation only with permission of the module coordinator				
Recommended semester	1. to 3. Semester				
Previous knowledge	Basic knowledge of Evolutionary Biology Good knowledge of the English language				

Elective module E32: Plant Stress Physiology

Module responsibility	Members of the working group plant physiology

Language	English; German				
Learning outcomes	• Advanced knowledge in plant stress physiology and implication for biotechnology • Critical reflection of current scientific publications in plant stress physiology • Chairing group discussions				
Module content	• Molecular and biochemical principles of stressor perception and stress adaption in plants • Abiotic and biotic stressors • Applied research • Physiology of root development and adaptation to soil • Physiology of nutrient uptake				
Courses	6 ECTS are to be acquired	SWS	Contact time (in h)	Self studies	Total workload
	Plant Stress Physiology (V)	2	30	90	180
	Molecular interaction of the plant root with the environment (V)	2	30		
	Communication in plants (S)	2	30		
Assessment	1 written test (90 min) to content of the lectures; oral presentation (20 minutes)				
Frequency	annually				
Duration	2 semester				
Prerequisites	Restricted participation capacity, participation only with permission of the module leader				
Recommended semester	1st or 3st semester				
Previous knowledge	Basic principles of plant physiology; advanced knowledge in plant development				

Elective module E33: Practical course in plant stress physiology					
Module responsibility	Members of the working group plant physiology				
Language	English; German				
Learning outcomes	• In-depth understanding of biochemical and molecular mechanism of plants to respond dynamically to changes in environment • Practical knowledge in analyzing molecular and biochemical stress parameters • Editing, presentation and discussion of scientific data				
Module content	• Testing of scientific hypothesis • Design of scientific experiments; conception, performance and evaluation of experiments in the field of plant stress physiology				
Courses	6 ECTS are to be acquired	SWS	Contact - time (in	Self - studies	Total workload

			h)		
	Practical course in plant stress physiology (P)	5	75	105	180
Assessment	Exercise works (10 pages)				
Frequency	Annually, winter semester (As a block course in intermediate semester)				
Duration	1 semester				
Prerequisites	Restricted participation capacity, participation only after completion or simultaneously to Elective module „Plant Stress Physiology“ (E32)				
Recommended semester	3. semester				
Previous knowledge	Module „Plant Stress Physiology“				

Elective Module E34: Climate Change					
Module responsibility	Prof. Martin Wilmking, Ph.D.				
Lecturer	Prof. Martin Wilmking, Ph.D. and members AG Landschaftsökologie und Ökosystemdynamik				
Language	English				
Learning outcomes	• Advanced understanding in the general field of climate change • Ability to critically reflect current scientific literature • Development of group working skills (“peer learning”), group discussions and group presentations (talks or posters)				
Module content	• Scientific basics of climate change • The global climate system • The earth’s energy budget • Paleoclimate of the earth • The global carbon cycle • Teleconnections and general circulation pattern of the global climate system • Human impacts on natural climate variability • Abrupt climate change • Recent scientific literature about climate change and related topics				
Courses (in h)	6 ETCS are to be acquired	SWS	Contact - time (in h)	Self-study	Total workload
	Climate Change	V 2	30	120	180
	Journal Club Climate Change	S 2	30		
Assessment	Testat 30 minutes, peer-group presentation in Journal Club				
Frequency	Annually, Summer semester				
Duration	1 Semester				
Prerequisites	Permission of instructor required				
Recommended semester	1.-3. Semester				
Previous knowledge	General climatology and meteorology				

Recommended literature	IPCC: Assessment Reports Climate Crash, John Cox

Elective Module E35: Dendrochronology					
Module responsibility	Prof. M. Wilmking				
Lecturer	Members of the working group „Landscape ecology and ecosystem dynamics“				
Language	English				
Learning outcomes	• Introduction to dendrochronology • Basic understanding in how to use annual growth rings for the analysis and reconstruction of past climate and environments • Basics in time series analysis • The ability to plan a scientific study which uses annual growth rings for reconstructing past environments				
Module content	• Sampling design • Sampling of trees, shrubs and fossil wood • Sample preparation (sanding, microsections) • Sample analysis (tree ring width, wood density) • Chronology building • Analysis of environmental drivers • Reconstruction of past environments • Use of the international tree ring data bank				
Courses (in h)	6 ETCS are to be acquired	SWS	Contact - time (in h)	Self-study	Total workload
	Dendrochronology (Ü)	4	60	120	180
Assessment	Presentation *				
Frequency	SS or WS				
Duration	1 Semester (Block 7-8 days)				
Prerequisites	permission of instructor required				
Recommended semester	1.-4. Semester				
Previous knowledge					
Recommended literature	Jim Speer, Fundamentals of Tree Ring Research M. Stokes and T. Smile, An introduction to Tree-ring dating Hal Fritts, Tree Rings and Climate				

Elective Module E36: Environmental Hydrogeology	
Module responsibility	Head of working group Applied Geology and Hydrogeology

Language	English				
Learning outcomes	• Knowledge on aspects of ground water ecology as well as sustainability of groundwater management • Skills for the determination of groundwater contaminants and remediation in the frame of a risk assessment • Knowledge about groundwater use in industrialized and developing countries • Practical skills on numerical groundwater flow and transport modelling • Competencies related to the communication of scientific topics in a well structured fashion • Skills in teamworking				
Module content	• Regional hydrogeology with special focus on soils and groundwater risks through natural or anthropogenic processes • Environmental aspects in urban and rural regions of industrialized and developing countries • Methods in sustainable groundwater management • Types of ground water contamination • Groundwater remediation methods • Numerical ground water flow and transport of materials modelling				
Courses	6 ETCS are to be acquired	SWS	Contact time (in h)	Self study	Total workload
	Environmental Hydrogeology (V)	1	15	90	180
	Theory of Groundwater flow modelling (V)	1	15		
	Groundwater modelling (Ü)	4	60		
Assessment	Portfolio				
Frequency	Annual, summer semester				
Duration	1 Semester				
Prerequisites	Limited number of participants, participation only with permission of the module coordinator				
Recommended semester	2. Semester				
Previous knowledge	Hydrogeology, Hydrogeochemistry, sound skills in mathematics and computer skills				

Elective Module E37: Facies analysis of glacial deposits	
Module responsibility	Head of working group Quaternary geology
Language	English
Learning outcomes	• Understanding of the concept of facies and different approaches to facies analysis • Skills in the identification and differentiation between glacial facies types (e.g. subglacial, ice marginal, supraglacial) • Knowledge and application of modern till classfication schemes as well as terminology of its micromorphology

	• Skill on the identification, analysis and genetical interpretation of micromorphological structures in glacial sediments				
Module content	• Diagnostic criteria of glacial sediments • Erosion, material uptake and transport through glaciers • Subglacial sedimentation processes and transport of material through glaciers • Till sedimentology and classification • Analytical methods in micromorphology and microfacies analysis of glacial sedminents (polarized light microscopy) • Practical field work (facies survey and interpretation)				
Courses	6 ETCS are to be acquired	SWS	Contact time (in h)	Self study	Total workload
	Facies analysis of glacial sediments (V)	2	30	105	180
	Fieldwork (P)	several days	30		
	Micromorphology of glacial sediments (Ü)	1	15		
Assessment	Portfolio (Short reports and presentations)				
Frequency	Annual, Winter semester				
Duration	1 Semester				
Prerequisites	None				
Recommended semester	1. or 3. Semester				
Previous knowledge	Basic knowledge of sedimentology, sediment deposition landforms and glacial geology (Lecture „Sedimentology / Quaternary Geology“)				

Elective Module E39: Geoarchaeology

Module responsibility	NN				
Language	German or English				
Learning outcomes	• Understanding and application of geoarcheological research and problems • Knowlede about late pleistocene and holocene landscape formation dynamics in environments under glacial influence • Basic knowledge about post glacial settlement history in Central Europea • Recognition of geomorphological and sedimentological images of human settlement and land use history				
Module content	• Geoarcheological methods for the laboratory and field • Late pleistocene and holocene landscape history in early quaternary environments • Applied geoarcheological research (Case studies) • Geoarcheological field practical exercises				
Courses	6 ETCS are to be acquired	SWS	Contact time (in h)	Self study	Total workload
	Introduction to geoarcheology (V)	2	30	90	180
	Geoarcheological fieldwork practical exercise	5	40		

	(P)				
Assessment	Wriitten exam (90 minutes) about the lecture, written report (10 pages) in the practical exercises				
Frequency	Annual, Winter semester				
Duration	1 Semester				
Prerequisites	None				
Recommended semester	2. Semester				
Previous knowledge	B.Sc. Geology modules :“General quaternary geology“, „Depositional environments and quaternary geology“; B.Sc. Geography module: „Pedology“				

Elective Module E43: Restoration ecology					
Module responsibility	Head of working group Peatland Studies and Palaeoecology				
Language	English				
Learning outcomes	• Advanced knowledge in restoration ecology • Critical reflection of practical restoration • Ability to present and discuss in public				
Module content	**Lecture/Seminar „Mire restoration** • Definition of restoration • History of peatland restoration • Degradation of peatlands: history, processes, levels • Ecosystem services and targets of restoration • Restoration for different purposes (nature conservation, climate, paludiculture) • Planning, targets, limits • Public participation and stakeholder involvement • financial aspects and subsidies **Seminar Restoration ecology** • Literature research und -analysis in ecological restoration • Preparation und presentation of an issue • Discussion of presentation style and content				
Courses	6 ETCS are to be acquired	SWS	Contact - time (in h)	Self - study	Total workload
	Restoration ecology (S)	2	30	120	180
	Mire restoration (V/S)	2	30		
Assessment	Presentation (Restoration ecology, 20 minutes) and confirmation of participation* (Mire restoration)				
Frequency	Annually, winter semester				
Duration	1st semester				
Prerequisites					
Recommended semester	1st.-3rd. semester				
Previous knowledge					

Elective Module E44: Mire ecology and regionality					
Module responsibility	Head of working group Peatland Studies and Palaeoecology				
Language	English				
Learning outcomes	• Acquisition of special knowledge in landscape ecology and ecohydrology of peatlands • Overview about the most important peatland types, their characteristics and distribution in the world				
Module content	• Peatlands and peat: Definitions • Classification of peatlands and –terminology • Reasons for nature conservation and their relevance for peatland classification • ecological and hydrogenetic peatland types • Peatlands of temperate, boreal, subarctic und arctic regions, the steppes und subtropics, the tropics of SE Asia, Africa and S-America, the temperate peatland regions of the south and the mountains • Ecohydrology: Basics of an application-oriented discipline • Peat, water and peat accumulation • Site hydrology, redox potentials, processes of matter-transformation • Chemistry of water, nutrient-limitations, eutrophication and vegetation • Indicators, Ellenberg indicator values, vegetation types • Patterns of groundwater flow and composition of groundwater • hydrological buffer zones and hydrological modelling • hydrogenetic peatland types • Self organisation and regulation in peatlands • regional relationships between peatlands, climate, groundwater and landscape				
Courses	6 ETCS are to be acquired	SWS	Contact-time (in h)	Self - study	Total workload
	Mires of the World (V)	2	30	120	180
	Peatland ecohydrology (S)	2	30		
Assessment	oral exam (25 minutes) about module content				
Frequency	annually, summer- and winter semester				
Duration	2 semester				
Prerequisites					
Recommended semester	1.-4. semester				
Previous knowledge	Stoffhaushalt der Moore				

Elective Module E45: Quaternary palaeoecology	
Module responsibility	Head of working group Mire studies and Palaeoecology
Language	English
Learning outcomes	• Knowledge about methods in quaternary palynology • Overview of the principles, methods and applications of

<table>
<tr><td></td><td colspan="5">palaeoecology
• Improvement in the skills of researching, presenting and discussing scientific topics</td></tr>
<tr><td>Module content</td><td colspan="5">• Morphology of the most important pollen and spore types, as well as other types of vegetation remnants
• Analysis and intepretation of pollen samples allong a surface transect
• Production, emission, distribution, deposition and sedimentation of pollen and spores
• Pollen associations, pollen diagrams and their interpretation
• Palynological analysis of peat and gyttja profiles
• Applied palynology: aeropalynology, reconstruction of vegetation, historical plant geography, climate reconstruction, cultural history, dating methods
• Presentation and interpretation of own results of analysis
• Time and concept of time
• Long term aspects of ecology, long term research
• Philosophy and principles of palaeoecology
• Archive: stratigraphical vs non-stratigraphical archives; cultural archives, natural archives
• Fossils and taphonomy: archivalia, microfossils, macrofossils, inorganic and organic material
• Methods: historical ecology; palynology; palaeobotany and dendrochronology; palaeozoology; inorganic and organic chemistry
• Dating methods
• Integrative palaeoecological case studies</td></tr>
<tr><td rowspan="3">Courses</td><td>6 ETCS are to be acquired</td><td>SWS</td><td>Contact time (in h)</td><td>Self study</td><td>Total workload</td></tr>
<tr><td>Palaeoecology (V/S)</td><td>2</td><td>30</td><td rowspan="2">90</td><td rowspan="2">180</td></tr>
<tr><td>Practical Quaternary palynology (V/S/P)</td><td>4</td><td>60</td></tr>
<tr><td>Assessment</td><td colspan="5">Presentation (Palaeoecology, 20 minutes) and written report (Quaternary palynology, 20 pages)</td></tr>
<tr><td>Frequency</td><td colspan="5">Biannual, semester break of winter semester, block course</td></tr>
<tr><td>Duration</td><td colspan="5">1 Semester</td></tr>
<tr><td>Prerequisites</td><td colspan="5">limited number of participants</td></tr>
<tr><td>Recommended semester</td><td colspan="5">1.-3. Semester</td></tr>
<tr><td>Previous knowledge</td><td colspan="5">None</td></tr>
</table>

Elective Module E46: Peatlands and palaeoecology	
Module responsibility	Head of working group Peatland Studies and Palaeoecology
Language	English
Learning outcomes	• Knowledge about methods of macrofossil analysis • Deepening of knowledge about the search, presentation und discussion of scientific topics

<table>
<tr><td>Module content</td><td colspan="5">• Requirements for the conservation of plant remnants
• Decomposition-resistant plant species, -organs and -tissues; growth modes of some peatland plants and the resulting morphology of their remnants, characteristic types of tissue and their determination.
• Capabilities and limits of peat identification and limits of in-field peat identification, peat and peatland “systematics”
• Laboratory methods
• characteristic plant remnants and their (macro-) morphological and microscopic-histological differentiation: herbal peatland-plants, mosses, dwarf-shrubs and barks, fruit and seeds
• macrofossil analysis of a peat profile
• Studying of selected topics of the landscape ecological peatland studies
• Presentation of the results</td></tr>
<tr><td rowspan="3">Courses</td><td>6 ETCS are to be acquired</td><td>SWS</td><td>Contact-time (in h)</td><td>Self study</td><td>Total workload</td></tr>
<tr><td>Großpraktikum Macrofossil analysis (V/S/P)</td><td>2</td><td>40</td><td rowspan="2">110</td><td rowspan="2">180</td></tr>
<tr><td>Seminar landscape ecology of mires</td><td>2</td><td>30</td></tr>
<tr><td>Assessment</td><td colspan="5">Presentation (Seminar landscape ecology of mires, 20 Minutes), Protocol* (Macrofossil analysis, 10 pages)</td></tr>
<tr><td>Frequency</td><td colspan="5">biannual, block course in semester break in winter semester,</td></tr>
<tr><td>Duration</td><td colspan="5">2 semester</td></tr>
<tr><td>Prerequisites</td><td colspan="5">limited number of participants</td></tr>
<tr><td>Recommended semester</td><td colspan="5">1st.-3th. semester</td></tr>
<tr><td>Previous knowledge</td><td colspan="5"></td></tr>
</table>

<table>
<tr><th colspan="2">Elective Module E47: Ecology & Protection of Ecosystems in the Southern Hemisphere & the Tropics</th></tr>
<tr><td>Module responsibility</td><td>Representative for Sustainability at the rectorate</td></tr>
<tr><td>Language</td><td>English</td></tr>
<tr><td>Learning outcomes</td><td>• Knowledge of the most important processes, functions, developments and management alternatives of ecosystem types (e.g. tropical and subtropical forests, savannas, arid grasslands, tundra, deserts, wetlands, lakes, agrarian ecosystems and meadows) of the tropics and the southern hemisphere and deepened knowledge by means of case studies
• Knowledge about important ecosystem types which are of main relevance for questions of climate change and conservation of biodiversity as well as a broad understanding of the related ecological problems and approaches for possible solutions
• Experience in interactive, open teaching formats</td></tr>
<tr><td>Module content</td><td>• Ecological fundamentals and relevant problems
• Conservation of biodiversity of (sub-)tropical forests
• Climatic impact of landscape changes in cold regions of the southern hemisphere
• Protection and restoration of wetlands in the southern hemisphere and the tropics</td></tr>
</table>

<table>
<tr><td></td><td colspan="5">• Desertification, overgrazing and erosion
• Analysis of complex ecological processes on the basis of case studies of the tropics and the southern hemisphere</td></tr>
<tr><td rowspan="3">Courses</td><td>6 ETCS are to be acquired</td><td>SWS</td><td>Contact-time (in h)</td><td>Self - study</td><td>Total workload</td></tr>
<tr><td>Ecology & Protection of Ecosystems in the Southern Hemisphere & the Tropics (V/S)</td><td>2</td><td>30</td><td rowspan="2">120</td><td rowspan="2">180</td></tr>
<tr><td>Protection of Selected Ecosystems in the Southern Hemisphere & the Tropics (S/Ü)</td><td>2</td><td>30</td></tr>
<tr><td>Assessment</td><td colspan="5">1 Presentation (individual, 20 Minutes), 1 Presentation* (as a group presentation, 20 Minutes)</td></tr>
<tr><td>Frequency</td><td colspan="5">annually, Summer semester or Winter semester</td></tr>
<tr><td>Duration</td><td colspan="5">1 Semester</td></tr>
<tr><td>Prerequisites</td><td colspan="5">Limited number of participants, Participation only with the permission of the module coordinator</td></tr>
<tr><td>Recommended semester</td><td colspan="5">2.-3. Semester</td></tr>
<tr><td>Previous knowledge</td><td colspan="5">Basic knowledge of the types of ecosystems and vegetation of the earth, Lecture „Principles of Landscape Ecology“</td></tr>
</table>

<table>
<tr><th colspan="6">Elective Module E51: Advanced field skills</th></tr>
<tr><td>Module responsibility</td><td colspan="5">Prof. Martin Wilmking, Ph.D.</td></tr>
<tr><td>Lecturer</td><td colspan="5">Prof. Martin Wilmking, Ph.D. and members AG Landschaftsökologie und Ökosystemdynamik, invited guest lecturers</td></tr>
<tr><td>Language</td><td colspan="5">English or German</td></tr>
<tr><td>Learning outcomes</td><td colspan="5">• Equip students with the necessary basic information to safely plan and conduct scientific field work</td></tr>
<tr><td>Module content</td><td colspan="5">• Orientation and navigation with and without map and compass / GPS
• Introduction to differential GPS
• Advanced field mapping and surveys
• Introduction to data logging and installation of permanent (instrumented) plots
• Field books and notes
• Field safety and first aid
• Survival skills</td></tr>
<tr><td rowspan="2">Courses (in h)</td><td>6 ETCS are to be acquired</td><td>SWS</td><td>Contact-time (in h)</td><td>Self-study</td><td>Total workload</td></tr>
<tr><td>Advanced field skills</td><td>P 4</td><td>60</td><td>120</td><td>180</td></tr>
<tr><td>Assessment</td><td colspan="5">Attendance: Pass / fail</td></tr>
<tr><td>Frequency</td><td colspan="5">SS or WS</td></tr>
<tr><td>Duration</td><td colspan="5">1 Semester (block of several days)</td></tr>
<tr><td>Recommended semester</td><td colspan="5">1.-4. Semester, permission of instructor required</td></tr>
</table>

Previous knowledge	-
Recommended literature	-

Module "Master's thesis"		
Module responsibility	Chairman of the evaluation committee	
Language	English, German	
Learning outcomes	The student demonstrates that he has extended knowledge about the planning of a complex research project. The student is capable of formulating a research workplan and execute it by him- herself. She/he is capable of presenting research results in writing and through an oral defense of the master thesis, she/he shows the hability to communicate and discuss the performed research.	
Module content	• Ellaboration and presentation of a workplan for the selected master thesis research • Literature review • Development of a methodological strategy to solve the posed reserch problem • Execution of the planned tasks and application of appropriate analysis methods • Discussion of results and contextualization in the field of study • Writing of the master thesis • Master thesis defense	
Courses	30 ETCS are to be acquired	Total workload
	M.Sc. Thesis (Block: 6 months; 28 ECTS)	900
	Thesis Defense (S; 2 ECTS)	
Assessment	Written master thesis, Oral defense: Presentation and discussion of results	
Frequency	In agreement with supervisor	
Duration	1 Semester	
Prerequisites	Limited number of participants, participation only with the permission of the module coordinator (supervisor)	
Recommended semester	4. Semester	
Previous knowledge	Basic and Elective modules	